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DIVISION OF CHEMISTRY

The Composition of the Soils of South Texas

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†In cooperation with United States Department of Agriculture.

CONTENTS.

THE COMPOSITION OF THE SOILS OF SOUTH TEXAS.

By G. S. Fraps, Chemist.

This bulletin is the third of a series dealing with the chemical composition of typical Texas soils. Bulletin No. 99 contains a discussion of the composition of soils from Houston, Anderson, Lamar, Travis, Bexar, and Hays counties. Bulletin No. 125 contains the chemical composition of soils of Angelina, Bastrop, Brazoria, Cameron, Cherokee, Delta, Lamar, Hidalgo, Lavaca, Montgomery, Nacogdoches, Robertson, Rusk, Webb and Wilson counties. The samples referred to have been collected in a systematic way and represent definite areas and types of soil in the State. In addition to the ordinary chemical analyses, tests are made by means of pot experiments, and fundamental chemical investigations are being conducted. The object of the work is to ascertain the important characteristics of types of Texas soils. A thorough knowledge of soils is fundamental to agriculture, and the chemistry of the soil is so closely related to preservation of its fertility that it is hardly necessary to discuss the matter in such a publication as this.

This bulletin deals with the chemical composition of samples of soils from about thirty-three counties in the southern portion of the State of Texas. Most of the samples were sent in by agents of the Bureau of Soils, of the United States Department of Agriculture, in cooperation with this Division of the Experiment Station. Detailed reports of the area have been published by the Bureau of Soils, accompanied by maps showing the location of each area, as follows:

Reconnaissance soil survey of southwest Texas, including the counties of Bexar, Medina, Uvalde, Kinney, Maverick, Zavala, Frio, Atascosa, Wilson, Live Oak, McMullen, LaSalle, and Dimmit, an area of 16,416 square miles.

Reconnaissance soil survey of south Texas, including the counties of San Patricio, Nueces, Cameron, Hidalgo, Starr, Duval, Zapata and Webb, an area of 16,812 square miles. The counties of Willacy, Jim Wells and Brooks have since been formed in this area.

Reconnaissance soil survey of the central gulf coast area of Texas, including the counties of Brazoria, Matagorda, Calhoun, Aransas, Refugio, Bee, Goliad, Victoria, Jackson, Wharton, DeWitt and Karnes, an area of 10,728 square miles.

The total area embraced in this survey is, therefore, 43,956 square miles.

The Reconnaissance survey maps are on a scale of six miles to one inch. More detailed surveys are made on a scale of one mile to one inch. It is, of course, not possible to show as many types or differences in soils in a Reconnaissance survey, as in a detailed survey.

NEEDS OF THE SOIL.

Plant food is only one of the conditions which are necessary for the production of crops. Other conditions are equally important. Chemical

analysis deals almost entirely with the plant food of the soil. The other conditions depend largely upon the situation of the soil, the climatic conditions, and its physical character and structure.

It is essential for the proper growth of plants that they should have a sufficiency of water, light, the proper amount of space, a suitable temperature, that the soil should be in suitable physical condition, and well supplied with plant food. If any of these essentials is deficient, the production will be curtailed, and the decrease in production will be, to a certain extent, in proportion to the deficient condition.

Material which is essential to the growth of plants is termed *plant food.* Plants require a number of substances, but experience has shown that practically all soils contain a sufficiency of all kinds of plant food with the exception of phosphoric acid, nitrogen, and potash. The term "plant food" is often confined to these three substances, which are so often needed.

Lime may also be needed by the soil, but the object of an addition of lime is to correct the acidity of the soil, or perform other functions, rather than to serve as a plant food.

The object of fertilizers is to supply phosphoric acid, nitrogen or potash, in available forms; that is, in such compounds that plants can easily take up the plant food. Fertilizers are discussed in Bulletin No. 112, of this station.

A soil, to be fertile, must contain plant food in such forms that plants can secure a sufficient amount of it. A soil may contain a large quantity of plant food, yet not produce good crops, because the plants cannot secure the food which it contains. We apply the term *active plant food* to the plant food contained in the soil in such forms that plants can easily take it up.

PHYSICAL DEFICIENCES OF SOILS.

Some of the physical deficiencies of soils will here be mentioned only briefly.

The soil may be too shallow. If this is caused by rock near the surface, the soil is not suitable for cultivated crops. If caused by hardpan, it must be broken up. If caused by water, the soil may be drained. Soils in arid regions should be deeper than those in humid regions.

The soil may be too wet. If properly situated, this condition may be remedied by underdrainage, either by ditches or by tile drains.

Porous and stiff soils are both benefited by organic matter, such as is produced by manure or green crops plowed under. Lime may improve stiff soils, making them more easily worked.

Soils which blow away too easily may receive benefit from manure. A wind-break may also be of advantage.

CHEMICAL DEFICIENCIES.

Acid soils contain acid compounds. The remedy is to apply lime in sufficient amounts to correct the acid. Acid soils are not found in the areas discussed in this publication.

Alkali soils contain too much soluble salts. These consist of sulphate of soda, chloride of soda, and carbonate of soda, as a rule, but we have sometimes found calcium chloride to be present. Crops vary in their sensitiveness to alkali. Some plants will not stand much, while others will stand very large quantities. Alfalfa, when young, will not stand much alkali, but it appears to endure a large quantity when it is old and well established.

Most of the alkali which has been brought to our notice occurs in comparatively small spots, but often it is very troublesome on account of its effect upon the appearance of the field in which it occurs. The remedy for alkali is under-drainage, either by means of deep ditches or tile drains. Alkali is liable to occur in some of the soils of the areas here discussed.

Deficiency of Active Plant Food.—A soil cannot be productive unless it supplies the plant with sufficient food; that is, unless it contains sufficient "active" plant food. The amount of active plant food depends upon conditions surrounding the soil, as well as on its chemical and physical character. The presence of sufficient moisture, and of decaying vegetable matter, appear to aid in the maintenance of a supply of active plant food in the soil. A "run-down" soil may often be "brought up" by increasing the activity of the agencies which make inactive plant food active.

The probable needs of Texas soils for plant food is shown in the discussion of the analyses of the different types of soils.

Deficiency of Lime.—A soil which receives benefit from lime is usually considered to be an acid soil, but this is not necessarily the case, since lime has other effects upon the soil in addition to correcting acidity.

Deficiency in Organic Matter.—Organic matter contains the reserve store of nitrogen of the soil. It aids in producing a supply of active plant food, and it has a favorable effect upon the physical character of the soil. Organic matter decreases in a cultivated soil, and it becomes deficient under clean cultivation.

Many Texas soils are deficient in organic matter, and respond well to applications of it. Manure is very lasting in its effects. Green crops, turned under or grazed off, give good results.

CONSERVING SOIL FERTILITY.

Soil fertility is lost in a variety of ways, some of which are unavoidable, while others are, to a greater or less extent, avoidable.

Losses in Crops.—These may be characterized as unavoidable losses. The loss of plant food involved in wasting the by-products of the farm may be considerable. This should be avoided as much as possible.

The average number of pounds of plant food removed per acre by a number of Texas crops is shown in Table 1.

Table 1. Plant Food Removed by Crops in Pounds per Acre.

	Phosphoric Acid	Nitrogen	Potash	Valuation per acre
Corn, 40 bu., corn and cob	19	38	13	$ 9 52
Wheat, 25 bu	13	29	8	7 06
Oats, 40 bu	10	25	7	6 02
Cotton, 250 lbs., lint	0.1	0.8	0.7	21
Potatoes, Irish, 100 bu	10	20	36	6 76
Potatoes, sweet, 200 bu	20	28	72	11 12
Alfalfa, 4 tons	50	183*	143	48 18
Sorghum, 3 tons	29	84	134	26 58
Sugar cane, 20 tons	15	153	44	34 14
Onions, 30,000 lbs	37	72	72	20 93
Rice, 1,900 lbs	12	23	5	5 62

*A part of this nitrogen comes from the air.

The table also shows the valuation of the plant food in the crops at the valuation used in Texas during 1912-1913 for commercial fertilizers. The cost per pound of plant food is placed at twenty cents for nitrogen, and six cents for potash and phosphoric acid. Furthermore, the above figures apply only to the unmixed fertilizers; the cost in mixed fertilizers is greater, owing to the cost of mixing, sacking, handling, and manufacturer's and dealer's profit. Considering further, that the plant food applied in a fertilizer is never completely appropriated by the plant, we find that the valuation of the plant food in the crop is below what it would cost in commercial fertilizers.

Loss in By-Products.—This loss is largely avoidable. The amounts of plant food in by-products of crops of the size specified, are shown in Table 2. The value is also given showing what this plant food would cost if bought in commercial fertilizer materials.

Table 2. Plant Food in By-Products of Crops in Pounds per Acre.

	Phosphoric Acid Lbs.	Nitrogen Lbs.	Potash Lbs.	Valuation Per Acre
Cotton (seed, 500 lbs.)	7	16	8	$ 4 10
Cotton (stalk and leaves)	12	32	23	8 50
Corn (stalk and leaves)	6	22	29	6 50
Wheat (straw)	5	13	14	3 74
Oats (straw)	4	10	21	3 50
Rice (2,250 lbs., straw)	3	14	37	5 20

The by-products from the farm should, therefore, be utilized as much as possible. The man who sells his cotton seed may have to buy back the plant food he is selling, and pay a good deal more for it than he received for his seed. The rice farmer who wastes his rice straw ashes is losing about 37 pounds of potash per acre, which he will be obliged to buy back some day. The rice farmer loses about $2.70 worth of nitrogen per acre when he burns his straw. Cotton stalks, when burned, lose their nitrogen. The loss of nitrogen may have the value of $3.00 per acre. Therefore the loss of plant food involved in wasting the by-products of the farm may be considerable, and should be avoided as much as possible.

Winter rains may wash out fertility from a porous sandy soil when it

is bare. The loss falls upon the most expensive plant food, the nitrogen. The loss can be avoided by growing a cover crop during the winter, a practice which has been adopted to some extent in East Texas. The sandy soils of East Texas are more likely to lose their fertility in this way than the heavier soils of Central Texas or those of West Texas, where there is less rainfall. It is probable that fertilizer residues are washed out of the soil to a considerable extent from some of the light sandy soils. A winter cover crop is, therefore, recommended for the light sandy soils of East Texas. Mustard has been suggested, and oats are sometimes used, but a leguminous crop, if a suitable one can be found, would be preferable. Burr clover would be excellent for this purpose.

Washing.—In some sections of the State, unsuitable practices have been followed, with the result that the surface soil has been washed off, leaving the subsoil exposed. This is, of course, a serious loss, and such methods as prevent it should be followed. Terracing or hill-side ditches, deep plowing or plowing in a proper manner, or other well known methods of preventing washing, should be used.

Manure.—Texas soils need all the manure which can be saved for them. Manure is more lasting in its effect than fertilizers, and has effects upon the soil which fertilizers do not have. In dry regions, the manure should be well rotted. Part of the plant food in manure is washed out when the manure is exposed to rain. It should, therefore be protected from the rain. The manure pile should be kept moist and compact. If the manure is allowed to dry out, plant food is lost. If it is too loose, it ferments too rapidly. This is, however, too broad a subject to be discussed here in detail.

MAINTAINING SOIL FERTILITY.

Soil fertility is maintained by keeping up the supply of plant food and maintaining the soil in good physical condition. The studies in the succeeding pages of this bulletin show the probable needs for plant food of various types of Texas soils in the area described.

For soils which need phosphoric acid, it should be applied in the form of acid phosphate, bone meal, tankage, rock phosphate, or in some other form.

To soils which need potash, potash salts should be supplied. As information concerning fertilizers is published in Bulletin No. 112 of this Station, we will not go into this subject here.

To soils which need nitrogen, it may be supplied in small amounts, but nitrogen is entirely too expensive to be purchased in sufficient quantities to maintain the fertility of our soils for the growing of staple crops. The small quantities of nitrogen supplied in ordinary mixed fertilizers to cotton and corn contain but a fraction of the nitrogen needed by the crop. The soil cannot be maintained in fertile condition by this means.

The supply of nitrogen in the soil must be maintained by growing crops which take it from the air. These can be grazed, or plowed under, or fed and the manure applied. Crops which take nitrogen from the soil can then be grown. Only by such a method as this can we look forward to maintaining our soils in a fertile condition.

In view of the rapidly increasing price of nitrogen, which is already expensive, it is hoped that efforts to adopt a system of rotation which will keep our soils fertile will become increasingly effective.

Fertility may be maintained:

(a) By using manure liberally, both to supply plant food and to keep the soil in good physical condition.

(b) By growing leguminous crops to gather nitrogen from the air. They can be grazed or they can be plowed under, or they can be fed and the manure used. But to keep a soil fertile, and grow staple crops profitably, a rotation must be adopted, sooner or later, which includes legumes. Nitrogen is too expensive for the grower of staple crops to purchase sufficient quantities of it to keep his soil fertile; and it is becoming more expensive. The grower of staple crops must eventually arrange to secure the bulk of his nitrogen from the air.

(c) By the use of fertilizers. The proper use of fertilizers in connection with all the manure which can be saved, and the growing of leguminous crops, will keep the soil fertile.

HOW TO INCREASE FERTILITY.

What has been said in preceding sections, may aid in ascertaining soil deficiencies, or devising aids for increasing fertility. Under the discussion of analyses of the different types of soils is given some information which may aid in increasing their fertility.

In order to increase fertility, the cause, or causes of the low yield should be ascertained, if possible, and the proper remedy applied. Manure, leguminous crops, and fertilizers are efficient aids when needed, as is very often the case. Lime, or under-drainage should be used when necessary.

WHAT A CHEMICAL ANALYSIS SHOWS.

Chemical analysis shows the reserve store of plant food which the soil contains. It indicates how well the soil will wear; whether it will be productive and durable or whether it will deteriorate rapidly under cultivation.

Chemical analysis shows the probable deficiencies of the soil in plant food. It shows whether the soil contains a large store of plant food, or only a small quantity, and it indicates which kinds of plant food will probably be needed first.

Chemical analysis shows whether phosphoric acid, potash or nitrogen will probably be most needed.

Chemical analysis, and other studies, it is hoped, will enable us to apply the results of fertilizer experiments, and from experience, on a given type of soil in a certain section, to other types of soil in the same section and the same type in other sections of the State.

WHAT CHEMICAL ANALYSIS DOES NOT SHOW.

Chemical analysis does not show which of the two fertilizers of similar composition should give the best results. For example, it does not show whether an 8-1.65-2 or a 10-1.65-2 fertilizer would be better for cotton on the soil analyzed. That would depend upon the method

of plowing and cultivation practiced, the quantity and distribution of rainfall, and other conditions aside from the fertility of the soil.

Chemical analysis does not show what crops are adapted to the soil. This depends more largely upon the physical character and structure of the subsoil, climatic conditions, and other factors not related to the chemical composition.

The chemical analysis deals with the plant food contained in the soil, and not with the physical characteristics which modify its adaptation to various kinds of plants. There is, to some extent, a relation between the physical character of the soil and the crops best suited to the soil, but the climatic conditions must always be given serious consideration.

SOIL SERIES IN THE AREA.

The following is a condensed description of the various series of soils found in South Texas. More detailed descriptions of these individual types of soils are given in connection with the description of the areas.

Rolling to Hilly Upland Soils.

Houston Series.—Dark to black calcareous surface soil with dark to gray calcareous subsoil, which sometimes becomes white a few feet below the surface. They are derived from loosely consolidated limestone, and are black prairie soils in part of the State.

San Antonio Series.—Dark colored soils with a reddish cast overlying red or brownish red heavier subsoil, which passes into a white calcareous material at a depth of three to five feet. They are derived from deposits brought down from Edwards Plateau.

Crockett Series.—Dark colored soils overlying a yellowish brown, red or mottled red and brown subsoil, below which is a reddish or yellowish sandstone.

Goliad Series.—Light brown to black soils overlying brownish red clay loam subsoils, beneath which is a white rotten limestone which sometimes crops out.

Lufkin Series.—Gray surface soil with mottled gray and yellow, plastic rather impervious subsoil, derived from weathering of noncalcareous Tertiary sands and clays.

Susequehanna Series.—Gray and sandy surface soils with a red or mottled red and gray, plastic clay subsoil.

Karnes Series.—Gray and brown colored soils with a yellowish gray sandy clay. They contain shells. This soil is found only along the San Antonio and Cibolo rivers.

Duval Series.—Bright red surface soils with bright red subsoil containing a low lime content and high percentage of iron. They are derived from the weathering of red sands or clays.

Orangeburg Series.—Reddish colored soils with red sandy clay subsoils, derived from the weathering of the Lafayette formation. They are closely related to the Duval series, being lighter in color. They also differ from the Duval series in that the native vegetation consists of oaks. These soils are of very limited extent in the arid sections.

Webb Series.—Brown to reddish brown soils resting upon somewhat

redder subsoils of heavier texture. Underlying these at varying depths and sometimes appearing at the surface is a gray sandstone. These soils are related to the soils of Duval series but are not nearly so red.

Norfolk Series.—Gray surface soils with gray to yellow sands or sandy loam subsoil.

Brennan Series.—Gray to light brown soils with a subsoil of similar texture, found in somewhat large areas in South Texas.

Zapata Series.—Gray sandy soils often stony in character, and sometimes only a few inches to the rock, of ranch topography.

Beeville Series.—Light gray or white deposits, with loose surface soils which overlie white, sticky, plastic clays.

Maverick Series.—Gray to light brown soils with light brown subsoils, of calcareous material. They may be considered as the arid climate extension of the Houston series.

Soils of the Level Coast Country.

Victoria Series.—Dark gray to black surface soils with dark subsoil, though somewhat lighter than the surface soil. These are found in the level coast country.

Lomalta Series.—Black soils, low, level, and poorly drained, having little agricultural value except for grazing.

Point Isabel Series.—Gray soils, poorly drained and of low agricultural value, of recent marine origin.

Nueces Series.—Deep gray sands, from two to three feet in depth, mostly in pasture.

Galveston Sand.—Deep gray or white sand, which drifts easily, on narrow islands along the coast.

Edna Series.—Light colored soils probably formed at the same time as the Victoria series of soil. They are not calcareous in nature.

Alluvial and Terrace Soils.

Frio Series.—Soils of sedimentary origin, though not recent, found along many of the streams in South Texas. They contain less lime and more organic matter than the soils of the Blanco and Laredo series, and have a darker color.

Uvalde Series.—Soils derived from Uvalde and Llano formation and occupying valleys and broad flood plains in Southwest Texas. They are gray to light brown loams, and contain much lime.

Blanco Series.—Light gray, reddish gray or yellowish brown calcareous soils deposited in former times by flood waters along stream valleys. The soils are found on narrow terraces 20 to 60 feet above present channels.

Laredo Series.—Gray to light brown alluvial soils of the Rio Grande valley, lying 20 to 40 feet above the river.

Trinity Series.—Alluvial soils derived from materials from soils of the Houston series, found along the Nueces river.

Cameron Series.—Alluvial soils on low flat areas, dark in color and heavy in character, poorly drained.

DESCRIPTION OF SOIL TYPES.

The following is a description of the various soil types found in the areas discussed. These descriptions are condensed from the reports of the Bureau of Soils, referred to on preceding pages.

Beeville Fine Sandy Loam.—The soil of this type consists of 10 to 20 inches of gray fine sandy loam. The subsoil consists of a gray stratified clay, sometimes mottled with yellow; the lime between soil and subsoil is generally plainly marked.

The Beeville fine sandy loam is more sedimentary in origin than alluvial and may be considered an extension of the Pleistocene formation of the level coast country up the smaller streams.

The type has a valley-like topography, and drainage is fair, but artificial drainage would be beneficial on some areas. The soil is found in strips along the larger dry creeks of Karnes, Bee and Goliad counties. The type supports a growth of live oak, post oak, mesquite and chaparral.

When properly handled, the Beeville fine sandy loam maintains moisture well, but very little of it is under cultivation. Cotton and corn are grown to some extent, and a small acreage is devoted to vegetables. Truck crops could be grown profitably where transportation facilities are convenient. For analysis, see soils of Bee county.

Blanco Silt Loam and Fine Sandy Loam (Undifferentiated).—The soil of the predominating silt loam to a depth of three feet or more, consists of a gray to light grayish yellow silt loam. There is no distinct line of demarkation between the soil and subsoil, the latter, however, being somewhat tighter. The type is high in lime and is locally known as "shelly land." The soil is undoubtedly alluvial but not of recent deposit.

The soil occurs in strips along nearly all the streams in southern Bexar and Medina counties, and along the Sabinal river in Uvalde county. The largest area is found along the Frio river in northern Frio county.

The topography is almost flat but it has excellent natural drainage. The native vegetation consists of a heavy growth of pecan, mesquite and hackberry. Large cypress trees extend for miles along the banks of the streams. Prickly pear and shrubs are seen, but very little grass is found.

A large acreage of this soil in Bexar and Medina counties is cultivated. Cotton, sorn, oats, and sorghum are the chief crops grown. Corn yields 20 to 25 bushels, and cotton from one-third to one bale per acre, the latter yield, however, is exceptional. For analysis, see soils of Medina county.

Brennan Fine Sandy Loam.—The soil of this type consists of a gray to light brown fine sandy loam high in lime, grading into a heavy compact sandy loam subsoil at a depth of ten to twelve inches. This subsoil is gray or grayish brown in color and has the appearance of hard baked clay when dry.

The Brennan fine sandy loam has been formed from a deposit of calcareous fine sandy loam or sandy clay of Pleistocene age. The small rainfall has prevented leaching out of the lime, and the type shows the characteristics of an arid soil.

The type is found east of Lando and north of Aguilares almost to the St. Louis, Brownsville and Mexico Railroad, and is mostly north of the Hidalgo branch of that road. It is one of the most extensively developed soils in the area surveyed. The soil has a level to gently rolling topography. The greater part of the type is undulating, so as to permit of irrigation without much leveling of the land.

The native vegetation consists of mesquite, chaparral, and prickly pear or cactus. The growth is usually stunted.

This type is devoted almost entirely to pasture and a very large proportion must continue to be used for this purpose, since it is not situated where irrigation is practicable. Almost the only water supply of a large area is the stored storm waters. Near Mercedes, Donna and Mission, are areas which are being cleared and placed under the ditch. Grapes, truck crops, and fruits should do well on this soil. Alfalfa and watermelons should also be profitable under irrigation. Dry farming has been practiced to a limited extent with fair success and it is the only way that a large part of this type can ever be used.

For analysis, see soils of Hidalgo county.

Duval Fine Sandy Loam.—The Duval fine sandy loam consists of about eighteen inches of red or brownish red fine sandy loam underlain by a bright red sandy compact clay, carrying sufficient sand to give it the texture of a heavy fine sandy loam in the lighter areas. The depth of the surface soil varies from twelve to fourteen inches, and the texture from a loamy fine sand to a heavy fine sandy loam. The surface soil is easily worked and often drifts. When wet, the subsoil is plastic and coherent, and if worked in this condition, forms into small soft clods, which are easily broken down.

The type has been derived from the weathering of alluvial deposits of red sands and clays, probably of Lafayette formation. This soil comprises one half of Frio county and LaSalle county, the eastern parts of Dimmit and Zavala counties, a part of southern Medina, extensive areas in Duval and Webb counties, and a somewhat broken strip across Atascosa county.

The topography of the greater part of the type is gently rolling to undulating. The surface is more hilly near the larger streams. The land is well drained.

The native vegetation consists of a heavy growth of mesquite, chaparral and prickly pear. Only a small amount of grass is to be seen.

Most of the type is still used for pasturage, although large areas have been cleared and put under cultivation. The land is well suited to the growth of truck, and cotton, and to a less extent, of corn. Cotton is the chief crop, fields of 1000 to 3000 acres in extent being operated by single owners in central Frio county. The average yield of cotton varies from one-half to one bale per acre according to rainfall. Corn averages about twenty bushels per acre. Sorghum and oats are grown and melons, potatoes, beans, peas, cantaloupes and tomatoes do well. For analysis, see soils of Duval, Frio and Wilson counties.

Duval Sandy Loams.—The soil consists of eight to twelve inches of reddish brown or chocolate medium to fine sand loam, below which is

a red or yellowish-red sandy clay. The type varies considerably in color and texture.

The soil is derived from material laid down during the Eocene period. The topography is slightly undulating and drainage is good.

The soil, locally known as "red sandy mesquite land," occurs in northern Karnes county, and extends northward into Wilson county. Small areas are found in Bee county. In its virgin state the soil supports a growth of live oak, post oak, mesquite and chaparral.

A part of the type in Karnes county is cleared and under cultivation. Cotton yields from one-half to three-fourths bale per acre and corn averages twenty-five bushels. For analysis, see soils of Karnes county.

Duval Loam.—The Duval loam consists of about ten inches of reddish-brown to red loam, underlain by a bright red to reddish-brown sandy clay. The type varies in depth, color, and texture.

The soil is derived principally from the weathering of sedimentary deposits laid down near the beginning of the Tertiary time. It occupies rather high ridges and rounded knolls in the larger areas of Duval fine sandy loam. Drainage is good and danger of erosion is slight.

This type is not extensively developed. Areas of the soil occur along the line between Uvalde and Zavala counties, in southern Bexar, eastern Frio and central Atascosa counties. The native vegetation consists of mesquite, chaparral, huisache and prickly pear. Grass and weeds are plentiful only in seasons of sufficient rainfall.

Only a small part of the type is used for crops. Several farms are being operated without irrigation in Bexar and Atascosa counties. Cotton, corn and sorghum are the principal crops grown, the yield varying with the rainfall. Cotton yields on an average from one-fifth to one-third bale per acre, and corn from fifteen to twenty bushels.

For analysis, see soils of Atascosa and Uvalde counties.

Duval Fine Sand.—The surface soil consists of fifteen to twenty inches of loose fine to medium sand, varying in color from grayish brown to brownish red. The subsoil is similar to the soil in texture, but is much more compact and of a more decidedly red to reddish brown color. The soil is low in organic matter, loose and incoherent and is easily shifted by the winds.

The soil is derived from the weathering of a deep deposit of fine and medium sands. The topography is level to gently rolling. The drainage is good and erosion is slight. The soil holds moisture well. The type is of comparatively small extent, the largest body being in western Dimmit county. Small bodies are found elsewhere in this county.

Most of the type is open prairie, supporting here and there a clump of scrubby oak, dwarfed mesquite, and chaparral. A sparse growth of coarse and unpalatable grass is sometimes seen.

None of the soil is at present under irrigation but small areas have been farmed for several years. During the seasons of average rainfall, very profitable yields of cotton, corn, and forage crops have been secured. Watermelons and early vegetables do well in favorable seasons. For analysis, see soils of Duval and Dimmit counties.

Edna Loam.—The soil of the Edna loam consists of ten to twelve inches of a gray to dark gray loam or silty loam. The subsoil to a depth of thirty-six inches consists of a dark gray clay or clay loam. Numerous white spots, which support little or no vegetation, are found on the surface.

The type has been formed by the weathering of the sedimentary clays of the coast prairie. It is a level prairie soil, covered with sedge and other grasses, and drainage is often poor. Variously good sized bodies of the soil occur in Matagorda, Wharton and Jackson counties.

The greater part of the type is still used for pasture. One-third bale of cotton is about the average yield per acre, and twenty-five bushels of corn. The soil yields ten to twelve sacks of rice per acre, for which it is well adapted. Where the land is well drained, fair yields of truck crops are secured.

For analysis, see soils of Matagorda and Wharton counties.

Edna Fine Sandy Loam.—The soil is a gray to dark gray fine sandy loam or loamy fine sand, eight to twenty inches deep. The subsoil for thirty-six inches, consists of a mottled gray and yellow clay. It is known locally as "prairie sandy land" and some areas are often spoken of as "crawfish land" or "run together sand."

The soil is sedimentary in origin and the surface is almost level throughout the area. Areas near the streams are often well drained but most of it is poorly drained. It could be easily drained by ditches.

The Edna fine sandy loam is found in large connected bodies, sometimes forming half the area of a single county, situated near the inner edge of the level coast country. Little of it is found west of the Mission river in Refugio county, it being practically confined to the humid section of Texas.

Nearly all of the type exists as a broad flat prairie supporting a heavy growth of sedge grass. Live oak and post oak are found near the stream.

A large part of the type is still used for pasture, but much of it is in cultivation, the principal crops being corn, cotton and sorghum. Cotton yields, on an average, about one-third bale per acre, corn twenty to thirty bushels and rice ten to twelve sacks per acre. Truck crops do well if the land is well drained.

For analysis, see soils of Brazoria and Matagorda counties.

Frio Fine Sandy Loam.—This soil is one of the least uniform types in the area. It varies in depth from ten to thirty inches, in color from gray to dark brown, and in texture from loamy fine sand, to a fine sandy loam rather high in clay. The subsoil to a depth of thirty-six inches, is a heavy grayish fine sandy loam or sandy clay, becoming heavier in texture and lighter in color with depth.

The soil occurs in stream valleys, but is generally purely local in formation and varies with the character of the types adjoining. It is found as narrow strips along many of the small streams in Bexar and Medina counties. The largest body is found south of Oakville along the Nueces river in Live Oak county. Other areas occur along San

Miguel creek in Frio county and along the Leona river in northern Zavala county.

The type is generally level and is not always well drained. However, excessive rainfall is the exception in the region and little trouble is experienced from the deficient drainage. The type supports a heavy growth of mesquite, live oak, pecan, and hackberry, together with considerable chaparral, prickly pear and mesquite grass.

Because of the favorable moisture conditions, the type is one of the best in the area for agricultural purposes when irrigation is not available. The soil is well adapted to truck crops, cotton and corn. Cotton and corn are the chief crops, the former yielding from one-third to three-fourths bale and the latter from twenty-five to thirty bushels per acre. Johnson grass hay is cut in places, and pecans are profitable in Zavala county.

For analysis, see soils of Live Oak and Uvalde counties.

Frio Loam.—To a depth of fourteen inches, the soil consists of a grayish brown loam rather high in silt. At fourteen to thirty-six inches, the material is a light brown to gray loam, much lighter in color and heavier in texture than the surface. It is locally known as "shell land." The soil is easily cultivated, but should not be stirred while wet, as it puddles readily.

The Frio loam is partly alluvial and partly colluvial. It is well drained, both in soil and subsoil. The soil is nearly level, and is well suited to irrigation. This type occurs along the Nueces river from near the western edge of LaSalle county to a point about twelve miles southeast of Cotulla. Other areas are found along the Nueces river, and on the Frio river, between Erwin and Connor ranches and for several miles above and below Tilden.

This type supports a heavy growth of mesquite and cactus, as well as a good growth of native grasses, where moisture conditions are favorable.

A relatively larger proportion of this type is under cultivation than of any other in the area. Nearly all of the onion farms up and down the Rio Grande river from Cotulla are on this type of soil. During favorable years the yields of onions range from 18,000 to 25,000 pounds or more per acre. At present onions is the main crop grown, but diversification is beginning to be practiced. Cotton, with two irrigations, yields a bale or more, per acre.

For analysis, see soils of LaSalle county.

Frio Silty Clay Loam.—The surface soil consists of a grayish brown to dark brown silty clay loam, eight to fifteen inches deep. The subsoil to a depth of thirty-six inches is a gray to slightly yellowish gray or yellowish brown silty clay loam. It is easy to cultivate, though very apt to bake if stirred when too wet.

This is an alluvial soil which occupies stream valleys in Uvalde, Zavala, Frio and LaSalle counties. It can be easily irrigated. Cotton produces one-third to one-half bale per acre and corn twenty-five to thirty bushels.

For analyses, see soils of LaSalle and Uvalde counties.

Galveston Fine Sand.—This soil consists of a gray or white fine sand, many feet in depth. Where not protected by vegetation, the surface soil is constantly shifted by the wind.

This sand has been washed up by the waves of the gulf, and blown by the wind in dune-like forms. There are gently rolling areas of this sand, but generally it is in the form of large dunes. The type is confined to the narrow islands which skirt the Texas coast and to the Matagorda Peninsula. Considerable areas of the types are found without vegetation, although the more level areas support a coarse grass. The soil is mostly used for grazing, but on the level areas a small amount of trucking has been done.

For analysis, see soils of Bee and Matagorda counties.

Goliad Sandy Loam.—The soil consists of a dark gray to black medium, to fine sandy loam eight to fifteen inches deep. The subsoil to thirty-six inches, is a red or reddish brown clay loam, usually heavy and tenacious. The soil is underlain by a soft white limestone, and local exposures of this material constitute a shallow phase of the type, on the crests and slopes of ridges. The shallow phase cannot store water well and the effects of drouth are severe.

The Goliad Sandy Loams have a loose structure, are easily handled, and permit of cultivation over a wide range of moisture conditions.

The soil has been formed by the weathering of Tertiary sands deposited over calcareous material. The surface is rolling and the drainage is good. This type covers more than one-half of Bee county, and a considerable portion of DeWitt, northern Goliad, eastern Karnes and northwestern Victoria counties.

The native vegetation consists of post oak, mesquite, chaparral and prickly pear. The grass is mesquite and sedge grass.

A considerable area of the soil is cultivated and it is considered good farming and truck land. The principal crops are corn, cotton, broom corn, and some truck. Cotton yields from one-fourth to three-fourths bales per acre, and corn from twenty to thirty-five bushels. The soil is especially adapted to the growth of truck crops.

For analysis, see soils of Bee, DeWitt and Karnes counties.

Goliad Loam.—The Goliad Loam consists of about fourteen inches of a black or dark gray heavy loam. The subsoil consists of a black clay loam, passing at about eighteen inches into a reddish or reddish brown clay, containing numerous limestone fragments. A characteristic of the soil is the presence of numerous snail shells scattered over the surface.

The soil has been formed by the weathering of the underlying soft calcareous Tertiary material, with an admixture of sand, possibly of late Tertiary formation. The type is rolling, and drainage is good. The type is found in Bee, Goliad, Karnes and DeWitt counties, the largest development being in Goliad county. This type was formerly prairie and is now covered with a scattering growth of mesquite and chaparral, with an occasional clump of post oak. Mesquite grass is abundant and affords good pasturage.

Considerable areas of the Goliad Loam are under cultivation. It is quite productive and adapted to a wide range of crops. Cotton yields

one-fourth to one bale per acre, corn, twenty-five to thirty-five bushels, and broom-corn one-fifth to one-third ton. Sorghum produces several tons per acre. The soil is too heavy for early truck crops, but onions, cabbage, and Irish potatoes do well with proper cultivation.

For analysis, see soils of Bee, DeWitt, and Goliad counties.

Goliad Sands.—The type consists of a fine to medium sand, thirty-six or more inches deep, dark in color and resting on a reddish clay to sandy clay. The soil originated from the weathering of Tertiary sands. The surface is moderately rolling and the drainage is good. The native vegetation consists of grass and sometimes oak. The type occurs in scattered areas throughout DeWitt county. Cotton yields one-third to one-half bale and corn from fifteen to twenty-five bushels per acre. The soil is limited in extent and unimportant agriculturally.

For analysis, see soils of DeWitt county.

Houston Gravelly Clay.—The Houston Gravelly Clay is a brownish to black gravelly clay, varying in depth from a few inches to two feet, and averaging twenty inches. Below this is a porous mass of quartz gravel about three feet deep above unconsolidated white limestone.

The soil is found in the eastern part of the city of San Antonio, ten miles northeast of San Antonio, and in the region between Leon creek and the Medina river.

This soil is derived from the weathering of the underlying limestone, The land lies high and the drainage is excellent. Only a very small part of the land is in cultivation. Most of the land is covered with mesquite and cactus and is used almost exclusively for pasturage.

Cotton and corn are grown quite successfully in some parts of the valleys in wet seasons.

For analysis, see soils of Bexar county.

Houston Black Clay Loam.—The Houston Black Clay Loam is a heavy grayish brown to dark brown loam, or clay loam, eight to fifteen inches deep. The subsoil has the same texture but changes gradually from brownish gray to yellow at a depth of four to five feet. This soil is friable, easily worked, retains moisture well, endures drought and is productive. Cotton, corn, and sorghum are grown. This is a desirable soil. The soil is most typically developed on the gently rolling prairies around San Antonio.

For analysis, see soils of Bexar county.

Houston Clay Loam.—This soil to a depth of ten to twelve inches consists of a dark slate-colored heavy loam, or clay loam surface soil, underlain by a dark gray to black clay resting on lighter colored clay loam or clay from twenty-four to thirty-six inches deep. Below this is a lighter textured white calcareous clay over rotten limestone. Where moist conditions prevail, the soil is quite dark, and in the eastern part of the area, the subsoil is often of a yellowish cast. The soil is easily cultivated when plowed at the proper time.

The origin of the type is due in part, to the weathering of soft Cretaceous limestone, and in part to the weathering of white calcareous

clays, which were probably laid down during the Eocene period of the Tertiary age. The dark color of the soil is due to organic matter.

The largest bodies of this type occur in the southeastern part of LaSalle county, the central part of McMullen county, and the northwestern part of Live Oak county. Other bodies are found in Wilson, Atascosa and Bexar counties.

The topography varies from nearly level to gently rolling, nearly all being level enough for cultivation. The surface drainage is nearly always good.

Nearly all of the type supports a small growth of mesquite, chaparral, and prickly pear. The native grasses, especially the mesquite grass, make excellent growth in years of sufficient rainfall.

Considerable areas are under cultivation around San Antonio, and, if well worked, in years of favorable rainfall, it is considered a very valuable soil. The principal crops are cotton, corn, sorghum and oats. With good tillage, in favorable seasons cotton yields from one-half to two-thirds bale per acre and corn from thirty to fifty bushels per acre. However, under the dry conditions which usually prevail in this region, many disappointing yields have been secured. When not overstocked, it usually provides good pasture and under present conditions, the most profitable utilization of much of it lies along this line.

For analyses, see soils of Medina and LaSalle counties.

Houston Black Clay.—The Houston Black Clay consists of eight to twenty inches of black, heavy clay, underlain to a depth of thirty-six inches or more by heavy black to dark drab clay of very compact structure. Typically, the soil and subsoil are free from gravel. The soil is extremely heavy and tenacious when wet, but, on drying, becomes hard and compact, and tends to crack deeply. The soil is easily worked when cultivated at the proper time.

The Houston Black Clay has been derived through the weathering of several calcareous deposits which underlay the type at depths of three to ten feet. Of these the Taylor Marl formation of the upper Cretaceous period is the most important.

The soil is found only in a few small bodies in Bexar and Medina counties. The largest areas occur just south of the Balcones escarpment north of Castroville, between D'Hanis and Sabinal and at Dunlay. Other bodies are found south of Castroville, in the City of San Antonio, and between this city and the east line of the county.

The type has a rather level or flat topography and the drainage is poor, though ordinarily the rainfall is not sufficient to give trouble from this cause.

Until quite recently the type was open prairie covered with mesquite grass. However, a scattering growth of mesquite timber, chaparral, live oak, and prickly pear, are at present supported on some areas. The native vegetation stands drought well and therefore this land makes excellent pasturage.

In the vicinity of San Antonio and along the line of the Southern Pacific railroad in Medina county, a considerable part of the type has been put under cultivation. It suffers badly from drought if not cultivated frequently, but properly treated, it is one of the strongest soils

in the State. It is especially adapted to cotton, corn, oats and sorghum. In favorable seasons cotton yields from one-half to one bale per acre, and corn from thirty-five to fifty bushels. Oats yields forty to sixty bushels and sorghum from two to three tons.

For analysis, see soils of Medina county.

Houston Fine Sandy Loam.—The surface soil is a brown, black or dark gray fine sandy loam, eight to twelve inches deep. The subsoil to a depth of thirty-six inches is dark gray to brown, and varies from a heavy sandy loam to a clay. The soil is friable and easily worked, the drainage good. The land is productive, and yields from one-fourth to three-fourths bale cotton, twenty to forty bushels corn, and a good crop of sorghum.

For analysis, see soils of DeWitt county.

Houston Loam.—This soil is a gray to dark brown or black heavy sandy loam tc heavy loam, eight to fifteen inches deep, over a subsoil consisting of a gray, brown or yellowish clay loam or clay, below which is a white calcareous clay.

The soil has been formed by the weathering of calcareous deposits. The soil is situated as high, gently rolling prairies and is well drained. The Houston Loam occurs in the northern part of Karnes, DeWitt and Bee counties in large connected areas. It is the chief soil of Karnes county. Bodies occur northeast of Oakville, north of Tilden, and south of the Nueces river in McMullen and Live Oak counties. The type is found south and east of Artesia. Other bodies occur in the southern parts of Medina, and Atascosa counties near Noonan, Christine and Campbellton.

The type was formerly a treeless prairie covered with mesquite grass, but now supports a growth of mesquite, chaparral and prickly pear, often very heavy.

The soil is a strong one and adapted to all the staple crops of the region. Cotton and corn are the principal crops. Cotton yields one-fourth to three-fourths bale per acre, and corn from twenty to twenty-five bushels. The yields are often much higher. Sorghum, broom corn, and heavy truck crops do well.

For analysis, see soils of DeWitt, Karnes, Nueces, Atascosa, and LaSalle counties.

Laredo Clay.—This type consists of a brown silty clay to heavy clay surface soil, to a depth of twelve to fifteen inches, where it becomes lighter in color and heavier in texture. It is stiff and tenacious when wet and bakes on drying. Deep and large sun cracks often appear. The Laredo Clay was laid down by the overflow waters of the Rio Grande, and, although heavy, it is well drained. The largest areas of the type are between Mission and San Benito and northeast of Barreda.

The topography is almost level, with just enough slope to keep the water from standing on it. At present (1910), very little of this type is under cultivation. Near San Benito a field has been placed under irrigation and has produced excellent yields of cabbage, onions and other heavy truck crops. Celery, cauliflower, beets, and lettuce are grown to a limited extent and good returns have been secured. Cotton

produces one bale per acre, corn, and sugar cane do well. Extensive plans for the irrigation of this type are under way. Care should be taken to cultivate this soil when in proper moisture condition to prevent baking. This should prove a valuable soil for agricultural purposes.

For analysis, see soils of Cameron and Hidalgo counties.

Laredo Silt Loam.—This is a gray to light brown sandy loam soil to a depth of twelve inches, with a subsoil of similar character, but lighter in color, to a depth of several feet. It is an alluvial soil deposited by the Rio Grande, and occupies a strip of land along this river. It occupies level land, but with a gentle slope away from the stream. Under irrigation it yields good crops.

For analysis, see soils of Cameron and Webb counties.

Lomalta Clay.—The soil of the Lomalta Clay consists of twelve or sixteen inches of a dark or drab clay with a relatively high silt content, with a similar but somewhat lighter subsoil.

The soil is alluvial in origin and it is only a few feet above tide. The drainage is poor and a large part of the area is somewhat marshy.

The Lomalta Clay is found along the coast adjacent to Matagorda Bay, and some of the other bays. It is found most extensively developed in Brazoria county, although smaller areas are found elsewhere.

The characteristic native vegetation is salt grass. The soil is not cultivated but is used for grazing, for which it is best suited under the present conditions.

For analysis, see soils of Brazoria, Calhoun and Nueces counties.

Lomalta Fine Sandy Loam.—The soil consists of four to eighteen inches of gray, very fine sandy loam. The subsoil to thirty-six inches, is a gray or grayish brown clay, often mottled with white, and frequently containing lime concretions. The soil can be easily cultivated.

The type has been formed by the deposition of sandy material over areas of the clay. The surface is level to slightly undulating, and drainage is often poor. This type is found principally in southern Jackson county and in Calhoun county. It supports a native growth of sedge and salt grass.

Very little of this type is cultivated. Cotton yields about one-third bale per acre. It is not considered good agricultural land and much of it is used for grazing.

For analysis, see soils of Calhoun county.

Lufkin Sands.—The Lufkin Sands consist of a light gray, medium to fine sand, thirty-six or more inches deep; over a mottled yellow and gray clay. The soil is probably formed from sandy Tertiary deposits. The surface is rolling, in places hilly, and the drainage is good. The soil occurs in small scattered areas in Bee and Goliad counties. The native vegetation consists of post oak, coarse grass, and undergrowth.

Little of the type is cultivated; in the vicinity of Cuero it is used to some extent for truck growing.

For analyses, see soils of DeWitt county.

Lufkin Sandy Loam.—The soil is ten to eighteen inches deep and consists of a gray to light brown loamy fine sand or fine sandy loam. The subsoil to thirty-six inches consists of a drab or yellow clay, containing fine sand. The type has been formed from sand and clay sediments deposited during the Tertiary age.

The surface varies from gently undulating to rolling, and drainage is usually very good. The type occurs in large areas in DeWitt, Bee, Goliad and Victoria counties. Post oak, and live oak constitute the native vegetation, with sedge grass near the coastal prairie.

A considerable part of the type is cultivated, principally as small farms, the staple crops being cotton, corn, and sorghum. Cotton yields one-third to one-half bale per acre, corn from fifteen to twenty bushels, sweet potatoes 150 to 200 bushels and Irish potatoes from 75 to 100 bushels per acre. The yields depend largely on the rainfall.

For analyses, see soils of DeWitt and Goliad counties.

Maverick Loam.—The soil consists of ten to twelve inches of brown to light gray loam, underlain by a light brown to yellowish brown loam, becoming heavier in texture with depth and grading at about three feet into a compact clay loam or clay. Both soil and subsoil are highly calcareous but low in organic matter.

The type is derived from a mixture of coarse sandy deposits and heavier calcareous clays. The topography varies from almost level to gently rolling. The largest areas of the type are found in western Dimmit county and west-central Maverick county; there are also some in Zavala county.

The greater part of the type supports only a sparse growth of mesquite, chaparral, and prickly pear, the growth in the valleys being heavier. Grass is scanty and almost disappears in periods of long continued drought.

The land is easily cultivated and the limited acreage used for crops has shown that it is well suited to truck, onions, corn, cotton and forage crops.

For analysis, see soils of Dimmit county.

Maverick Clay Loam.—To an average depth of eight to ten inches, the soil consists of an ashy-gray to light brown clay loam, rich in lime. The soil becomes more compact with depth and at twenty-five to thirty inches is a light yellowish brown or drab colored clay.

The type is derived from the weathering of calcareous clays covering the underlying formations of sandstone or limestone. The type occurs in more or less extensive areas in nearly every part of Maverick, Dimmit, and Zavala counties and in the southern parts of Kinney and Uvalde counties.

The topography is generally gently rolling. The type generally is well drained with the exception of the lake basins. Some of the type was recently prairie but is now being rapidly covered with a growth of mesquite and prickly pear. Other sections already support a heavy growth of mesquite, chaparral, cactus, and grass to some extent.

Only a small percentage of the type is cultivated. In seasons of abundant rainfall, large yields of cotton, corn and forage crops are

secured, but in dry weather the soil has a tendency to become hard, dry, and baked, and good crops are certain only when irrigation is practiced.

For analysis, see soils of Dimmit county.

Miller Silty Clay.—This is a reddish brown silty clay fourteen inches deep covering a reddish brown silty clay loam. The land is known as "shell land." It was deposited at the same time as the Miller silt loam, and, is composed of materials from the same sources. The type lies some distance from the streams and is rarely overflowed. Most of the soil is adequately drained but open ditches are needed on some spots.

The type is found in extensive areas in Wharton and Matagorda counties. The native growth on the cultivated portions of the type consisted of dense forests of hardwoods, in which predominate oaks, hickory, ash, pecan and elm.

Corn and cotton are the principal crops. Corn yields twenty-five to fifty bushels, and cotton from one-half to one bale per acre.

For analysis, see soils of Wharton county.

Miller Silt Loam.—To a depth of fourteen inches the soil consists of a light reddish silt loam. The subsoil varies considerably, ranging from silt loam to silty clay.

The soil is of alluvial origin and consists of the sediments brought down by the Colorado and Brazos rivers from the red soils of the northwestern part of the State.

The soil occupies a gently sloping plain, and the drainage is excellent It is found in Wharton and Matagorda counties. Where not cultivated the soil is covered with a growth of oak, ash, sycamore, pecan and other trees.

Cotton, corn, and sugar cane are the principal crops. Yields of cotton have, at times, averaged one bale per acre. Corn yields forty to sixty bushels per acre, and sugar cane from twenty-five to forty tons.

For analysis, see soils of Wharton county.

Norfolk Fine Sand.—The Norfolk Fine Sand consists of a loose fine sand several feet in depth. The surface is light gray in color in the cultivated fields, but in the wooded areas somewhat darker. The subsoil is very similar to the soil, being a loose and incoherent, gray fine sand; it sometimes has a yellowish or reddish cast.

This soil is derived from the weathering of deep beds of sand of the Eocene period. In many places the formation still has the appearance of an ancient beach. The surface varies from almost level to gently rolling or hilly. The slopes are gentle and drainage good. Beginning near Devine in southern Medina county, the type extends in a general north-easterly direction across the southern part of Bexar, Atascosa, and the northern part of Wilson counties, forming an almost continuous strip six to eight miles wide. Other smaller areas are found in the area.

In the large areas, the soil is heavily timbered with black-jack oak, post oak, and hickory, with a few live oaks. The land is locally known as "black-jack land." Grasses are abundant and stand drought well.

Very little of the type is under cultivation, the greater part making

fairly good pasture. The soil is well adapted to the production of truck crops.

For analyses, see soils of Atascosa and Bexar counties.

Norfolk Silt Loam.—This soil is a loam of medium texture six to eight inches deep, yellowish brown to dark brown in color. The subsoil is brown to brownish yellow and a little looser in texture than the surface soil. This soil is much eroded. The water runs off in ravines and gullies. A small acreage is under cultivation. The soil is typically developed on the east side of Rosillo creek, ten miles southeast of San Antonio.

For analysis, see soils of Bexar county.

Nueces Fine Sand.—The Nueces fine sand consists of twelve to fifteen inches of loose gray, fine textured sand often containing enough silt, clay and organic matter to make it slightly loamy, underlaid by a fine sand of about the same texture, but containing less organic matter than the surface soil. The subsoil usually becomes lighter in color as the depth increases until, at about thirty-six inches, it is a very light gray. It is usually moist and compact. A stiff light drab clay underlies the deposit of fine sand at a depth of three to five feet below the surface.

The light sandy texture of the soil tends to make the natural drainage very thorough, but the heavy clay underlying the subsoil prevents excessive drainage and this together with the loose character of the surface soil, which reduces loss by evaporation, tends to maintain a supply of moisture within reach of deep rooted plants.

Very little cactus or mesquite is found on this soil but it supports a heavy growth of other native vegetation. It is easily cultivated but so loose and incoherent that care must be taken to prevent drifting. Very large yields of melons and sweet potatoes have been secured, especially where methods of cultivation were used which tended to conserve moisture.

A limited acreage has been planted to cotton, which yields about one-half bale per acre. Fair yields of early vegetables have been secured during favorable seasons. The greater part of this land is used for pasturage.

For analyses, see soils of Calhoun, Cameron and Nueces counties.

Pledger Silt Loam.—The Pledger Silt Loam is of comparatively unimportant extent but is a very productive soil. To a depth of fourteen inches it consists of a black or dark brown silty clay loam, high in organic matter. It never clods even when ploughed wet. The subsoil is a smooth, yellow, silty clay, which is itself productive wherever exposed. This land is the best in this section of Texas in dry seasons.

The soil is sedimentary and occupies low narrow ridges and high slopes adjacent to stream channels in the extensive alluvial region in the vicinity of the Brazos and Colorado rivers.

It is very limited in extent, occupying narrow ridges between Caney creek and the Brazos river. The native growth consists of hickory, oak, ash and other hardwoods, the wild peach being the characteristic tree.

Portions of this soil have been cultivated for more than forty years

and are still productive. It is the ideal corn soil of the area, producing from forty to sixty bushels per acre. Potatoes and cotton do well.

For analysis, see soils of Wharton county.

Rio Grande Silty Clay.—This is a dark brown to black silty clay or clay, about twelve inches deep, with a lighter colored and lighter textured subsoil, which is a light sand at a depth of about thirty-six inches. The soil was deposited by the Rio Grande, and occupies only small areas. It is cultivated to some extent and yields about thirty bushels corn.

For analyses, see soils of Cameron county.

San Antonio Silty Clay Loam.—The soil consists of six to ten inches of dark brown to black silty clay loam with a decidedly reddish tinge. The soil varies slightly in texture and color. The subsoil to thirty-six inches is usually a dull red to brownish red clay, containing a large amount of lime concretions. The soil is rich in organic matter and small snail shells and other calcareous materials are found scattered over the surface.

The soil is derived from the weathering of sedimentary deposits brought down from the limestone hills. The soil is rather extensive in the northern part of the area, occurring in large bodies in Bexar, Medina and Uvalde counties. The largest bodies are found along the Southern Pacific railroad between Hondo, Sabinal and Knippa. Areas are also encountered near San Antonio.

Mapped as San Antonio Clay Loam in the San Antonio Area, Texas, and as *Crawford Silty Clay* in the San Marcos Area, Texas.

The greater part of the type is nearly level, though a few areas have a slightly undulating to sloping surface. In seasons of excessive rainfall some of the type would suffer from lack of drainage. The type supports scattering to heavy growth of mesquite timber, and some chaparral. Several varieties of grass grow abundantly when rainfall is sufficient.

This is one of the best types of the area. During good seasons cotton averages one-half bale or more per acre, and corn from thirty-five to fifty bushels. The yields of sorghum and oats are high. The soil is loamy and readily cultivated when dry.

For analyses, see soils of Medina and Bexar counties.

Trinity Fine Sandy Loam and Loam.—The light textured soils found in some of the river bottoms consist of dark fine sandy loam to loam, and are usually found in small spots, sometimes near the upland margin.

The soil is alluvial, coming mainly from the sandy soil on the neighboring uplands. The soils are quite productive and give good yields of truck crops, cotton and corn.

For analysis, see soils of DeWitt county.

Trinity Clay.—This is the most extensive bottom land soil in the area. It consists of a black or a very dark gray clay with an average depth of twelve inches, underlain by a black or dark drab clay, somewhat lighter in color. The soil is rich in organic matter and lime, and it is more friable than the amount of clay would indicate.

The soil is alluvial in origin, and is generally level, and a large area is wet and swampy during a considerable part of the year. Nearly all

of the type is subject to overflow. The largest areas are found along the Brazos and Bernard rivers; areas are found also along the Colorado, Navadid, Lavaca, Guadalupe and San Antonio rivers.

Cotton was formerly the chief crop, sometimes yielding as high as one bale per acre. Corn yields from twenty-five to sixty bushels per acre, depending on season and method of cultivation employed. Alfalfa and rice grow well, and sugar cane, onions and cabbage can be grown to good advantage. In the future the type will be more largely used for the production of corn and alfalfa.

For analyses, see soils of DeWitt and Wharton counties.

Uvalde Silty Clay Loam.—This soil consists of ten to fifteen inches of gray to light brown silt loam. It is highly calcareous but contains little humus. The subsoil is a brown or yellowish brown silty clay loam. In its virgin state the surface is covered by a thin silty crust, which, when dry, is rather compact, but breaks up readily on cultivation. A loam phase of the type occurs in the vicinity of Hondo and along the Frio river, near the corner of Uvalde and Frio counties.

The soil was formed from material brought down the rivers from the Edwards Plateau during the Pleistocene time. The type is found in fairly large areas in Uvalde, Kinney, Zavala and Maverick counties. The largest bodies occur along the Crystal City and Uvalde railroad in northern Zavala county, and along the larger streams in western Kinney county. It is also found in small areas near the city of Uvalde.

It occurs as low flat terraces bordering the larger streams, and is one of the most level types in the area. Drainage is usually adequate.

As a rule, mesquite timber and prickly pear form a fairly constant growth on this type. Following sufficient rainfall, various weeds spring up and are succeeded in a few weeks by a vigorous growth of mesquite grass. On the loamy phase of the type the growth is mesquite, chaparral, and Spanish dagger.

At present little of this type is under cultivation. The soil is very productive and crop yields are largely a question of securing sufficient water. Under irrigation, this should prove to be one of the most productive types of the area. At present, the greater part is used for pasture.

For analysis, see soils of Uvalde county.

Victoria Clay.—The Victoria Clay is one of the most extensive and important soils of the coast country. It is locally known as "hog wallow land" and as "black land." The surface soil consists of eight to twelve inches of a heavy dark brown to black clay. It becomes lighter in color with depth and at two or three feet it is a light gray or drab. Both soil and subsoil are calcareous. The soil cracks deeply, is sticky when wet, and must be plowed when moisture conditions are just right, or proper cultivation is impossible.

The surface of the soil is almost level, and drainage by ditches would be of advantage in some of the areas. The Victoria Clay occurs in large connected areas throughout the coast country. Probably nearly one-third of this section consists of this type. The native vegetation

consist of a heavy growth of grasses on the spur prairie and some huisache, chaparral, mesquite and cactus in other sections.

The type is a strong one and is utilized to some extent for the growing of cotton, corn, sorghum, and rice. Large areas are still used for grazing. Cotton averages about one-half bale per acre, corn twenty to forty bushels, and rice ten to twelve sacks (1620 to 1944 pounds) per acre. The soil is suited to the growth of cabbage and onions, the former yielding 2000 to 15,000 pounds, and the latter 7000 to 8000 pounds per acre.

For analyses, see soils of Brazoria, Jackson, Matagorda, Refugio, Victoria, Wharton, Nueces and San Patricio counties.

Victoria Loam.—This soil is usually a dark brown to black heavy loam eight to twelve inches deep, grading into a dark gray or drab, or slate clay or clay loam subsoil. The soil is slightly sticky when wet and compact when dry, but when cultivated at the proper time, is quite friable and loamy.

The Victoria Loam has been formed by the admixture of fine sand with the heavy material which forms the Victoria Clay, which may have been brought about by water or by the wind. The topography is level to gently undulating or gently rolling. The larger areas in Jackson county would be helped by ditch drains.

The Victoria Loam is found only in small areas as slight elevated ridges, narrow and long, surrounded by the Victoria Clay; and again, occupying slopes near the stream valleys.

The greater part of this type occurs as grass-covered prairie, although in the western part of the area, it supports a small growth of mesquite, chaparral and cactus.

A considerable portion of the Victoria Loam is in cultivation and it is considered a desirable soil. It yields 10,000 to 15,000 pounds of onions per acre, 14,000 to 20,000 pounds of cabbage, one-fourth to three-fourths bale of cotton, and twenty to forty bushels of corn.

For analyses, see soils of Victoria and Nueces counties.

Victoria Fine Sandy Loam.—The soil of the Victoria fine sandy loam is a light brown to gray fine sandy loam with an average depth of ten to twelve inches. This is underlaid by a light drab sandy clay, which is often slightly mottled with iron stains. Deposits of lime are often found scattered through the deeper subsoil. There is a distinct line between the sandy surface soil and underlying clay, but the upper part of the subsoil contains a larger percentage of sand than that found at a depth of thirty to thirty-six inches. The Victoria Fine Sandy Loam is easily reduced to a thorough state of cultivation, and crops on this type can be given a thorough surface cultivation immediately after a rain, without forming clods or impairing the physical condition of the soil. The topography of the soil and its light sandy texture insure good natural drainage. The heavy clay subsoil aids materially in preventing excessive drainage in the more rolling areas, and the loose fine sand which is constantly shifted over the surface by the wind prevents excessive loss of moisture by evaporation, so that crops on this type suffer less from drought than those on some soils of a heavier texture.

The soil seems well adapted to the growing of early truck crops but it is necessary to fertilize heavily to produce good yields of onions and cabbage. It is well adapted to tomatoes and grows lettuce and cucumbers equal to those obtained on any other type in the area.

When shallow cultivation and other methods which tend to conserve moisture are practiced, the yields are always increased. Cotton gives about one-half bale per acre when fertilizer is used. Corn is grown to a limited extent and produces about twenty bushels to the acre. Without fertilization, the yield of onions is about 5000 pounds per acre, but where heavily fertilized and carefully cultivated, a yield of 10,000 to 12,000 pounds is secured.

For analyses, see soils of Victoria, Refugio, Duval and Nueces counties.

Webb Fine Sandy Loam.—Where typically developed, this type consits of twelve to fifteen inches of brown to reddish brown fine sandy loam, comparatively low in organic matter, and underlain by a brown to reddish-brown heavy fine sandy clay. The color, depth, and texture vary considerably throughout the type.

The Webb Fine Sandy Loam is derived mainly from the weathering of deposits of fine sand and sandy clay laid down over the older geological formations.

Large areas of the type occur in nearly every part of Dimmit, Zavala and Maverick counties, and in southern Bexar and northern Atascosa counties. The largest area lies northwest of Asherton and Carrizo Springs. The topography varies from level to gently rolling, and most of the land could be irrigated at small expense for leveling. Erosion is not a serious problem on this type.

The native forest consists of mesquite, chaparral and a scattering growth of live oak. A poor quality of grass grows abundantly on the type when rainfall is sufficient.

A larger proportion of the Webb Fine Sandy Loam is under cultivation than any other type in the area. Most of the cultivated land is irrigated by water from artesian wells. When thoroughly cultivated, and irrigated these areas produce large yields of vegetables, forage crops, cotton and corn. Cabbage, lettuce, and onions, are grown for shipment to Northern markets. The average yield of onions varies from 12,000 to 20,000 pounds per acre; corn yields from thirty to fifty bushels, and cotton from one-half to one bale per acre. Oats have been grown to a limited extent, and considerable truck is produced at Peteet. The principal crops are cotton, corn, and sorghum, and although profitable crops are grown in favorable seasons, the yield without irrigation on any crop is uncertain. Strawberries, watermelons and cantaloupes are grown both on irrigated and unirrigated land.

For analyses, see soils of Dimmit and Medina counties.

Zapata Fine Sandy Loam and Loam (Undifferentiated).—The prevailing soil, the fine sandy loam, is a dark gray or gray fine sandy loam to a depth of eight to twelve inches. The material becomes hard and compact as the depth increases and at thirty to thirty-six inches fragments of limestone are found. The type is nearly all underlain with

limestone at a depth of about three or four feet, although it is only a few inches from the surface in the large area around Ramirena. The type varies considerably in different parts of the area surveyed.

The soil is generally derived from the weathering of the underlying sandstone and limestone. The greatest development of the Zapata soils is in the southwestern part of Live Oak county and the southeastern part of McMullen county. Other areas are found in the northeast part of McMullen county near Crowther, and along the Rio Grande in Maverick county.

The surface is rolling to hilly and in many places quite broken. On the rough stony phases of the type, the native growth consists of small scrubby chaparral, gaujilio and prickly pear. On the lower slopes there is a good growth of mesquite.

The greater part of the land is suited to grazing. Southwest of Oakville for a distance of ten miles, it is well suited for agricultural purposes as any soil in that section. Irrigation would be expensive even if water were obtainable. While grass is generally not abundant, the gaujillo brush makes good feed for cattle.

For analysis, see soils of Dimmit county.

SOIL TYPES BY COUNTIES.

The following is a list of the types of soils found in the various counties, according to the maps published by the Bureau of Soils.

ARANSAS COUNTY.

Galveston fine sand.
Lomalta clay.
Lomalta loam.
Nueces fine sand.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

ATASCOSA COUNTY.

Blanco silt loam and fine sandy loam (undifferentiated).
Brennan fine sandy loam and loam (undifferentiated).
Duval fine sandy loam.
Duval gravelly soils.
Duval loam.
Houston clay loam.
Houston loam.
Norfolk fine sand.
Webb fine sandy loam.

BEE COUNTY.

Beeville fine sandy loam.
Duval sandy loams.
Goliad loam and Houston loam.
Goliad sandy loams.
Houston loam.
Lufkin sands.

Lufkin sandy loams.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

BEXAR COUNTY.

Blanco silt loam and fine sandy loam (undifferentiated).
Crockett loam.
Duval loam.
Houston black clay.
Houston clay.
Houston clay loam.
Houston loam.
Norfolk fine sand.
Orangeburg fine sand.
Rough stony land.
San Antonio silty clay loam.
Webb fine sandy loam.

BRAZORIA COUNTY.

Edna fine sandy loam.
Galveston fine sand.
Lomalta clay.
Miller silty clay.
Pledger silt loam.
Trinity clay.
Victoria clay.
Victoria loam.

BROOKS COUNTY.

Brennan fine sandy loam.
Duval fine sand.
Duval fine sandy loam.
Nueces fine sand.
Victoria fine sandy loam.
Victoria loam.
Zapata fine sandy loam.

CALHOUN COUNTY.

Edna fine sandy loam.
Galveston fine sand.
Lomalta clay.
Lomalta loam.
Lomalta fine sandy loam.
Nueces fine sand.
Trinity clay.
Victoria clay.
Victoria loam.

CAMERON COUNTY.

Brennan fine sandy loam.
Brennan loam.
Cameron clay.
Galveston fine sand.
Laredo clay.
Laredo silty clay loam.
Laredo silt loam.
Lomalta clay.
Lomalta fine sandy loam.
Lomalta loam.
Nueces fine sand.
Point Isabel clay.
Rio Grande silty clay.
Victoria fine sandy loam.
Victoria loam.

DEWITT COUNTY.

Goliad gravelly sandy loam.
Goliad loam and Houston loam.
Goliad sands.
Goliad sandy loams.
Houston clay loam.
Houston fine sandy loam.
Houston loam.
Lufkin gravelly sandy loam.
Lufkin sands.
Lufkin sandy loams.
Trinity clay.
Trinity fine sandy loam and loam.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

DIMMIT COUNTY.

Beeville fine sandy loam.
Cameron clay.
Duval fine sand.
Duval fine sandy loam.
Houston gravelly soils.
Maverick clay loam.
Maverick loam.
Webb fine sandy loam.
Webb silty clay loam.

DUVAL COUNTY.

Brennan fine sandy loam.
Duval fine sand.
Duval fine sandy loam.
Houston loam.

Victoria fine sandy loam.
Victoria loam.
Zapata fine sandy loam.

GOLIAD COUNTY.

Beeville fine sandy loam.
Edna fine sandy loam.
Edna loam.
Goliad loam and Houston loam.
Goliad sandy loams.
Karnes soils.
Lufkin sand.
Lufkin sandy loam.
Trinity clay.
Victoria clay.
Victoria fine sandy loam.

FRIO COUNTY.

Blanco fine sandy loam.
Brennan fine sandy loam and loam (undifferentiated).
Duval fine sandy loam.
Duval gravelly soil.
Duval loam.
Frio clay.
Frio fine sandy loam.
Houston clay loam.
Uvalde silty clay loam.
Webb fine sandy loam.

HIDALGO COUNTY.

Brennan fine sandy loam.
Brennan loam.
Cameron clay.
Duval fine sand.
Duval fine sandy loam.
Laredo clay.
Laredo silty clay loam
Laredo silt loam.
Nueces fine sand.
Rio Grande silty clay.
Victoria fine sandy loam.
Victoria loam.

JACKSON COUNTY.

Edna clay loam and Victoria clay loam.
Edna fine sandy loam.
Edna loam.
Lufkin sand.
Trinity clay.
Victoria clay.
Victoria loam.

JIM WELLS COUNTY

Duval fine sandy loam.
Houston loam.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.
Zapata fine sandy loam.

KARNES COUNTY.

Beeville fine sandy loam.
Duval sandy loam.
Goliad loam and Houston loam.
Goliad sandy loam.
Houston clay loam.
Houston fine sandy loam.
Houston loam.
Karnes soil.
Lufkin sandy loam.

KINNEY COUNTY.

Brackett stony clay loam.
Duval loam.
Frio clay.
Houston clay loam.
Laredo silt loam.
Rough stony land.
Uvalde gravelly soil.
Uvalde silty clay loam.

LASALLE COUNTY.

Duval fine sandy loam.
Frio fine sandy loam.
Frio loam.
Frio silty clay loam.
Houston clay loam.
Houston loam.
Trinity clay.

LIVE OAK COUNTY.

Brennan fine sandy loam and loam (undifferentiated).
Frio loam.
Frio silty clay loam.
Goliad fine sandy loam.
Houston clay loam.
Houston loam.
Norfolk fine sand.
Trinity clay.
Zapata fine sandy loam and loam (undifferentiated).

MCMULLEN COUNTY.

Brennan fine sandy loam and loam (undifferentiated).
Frio loam.
Frio silty clay loam.
Goliad fine sandy loam.
Houston gravelly soils.
Houston loam.
Trinity clay.
Zapata fine sandy loam and loam (undifferentiated).

MATAGORDA COUNTY.

Edna clay loam and Victoria clay loam.
Edna fine sandy loam.
Edna loam.
Galveston fine sand.
Lomalta clay.
Lomalta fine sandy loam.
Miller silt loam.
Miller silty clay.
Pledger silt loam.
Trinity clay.
Victoria clay.
Victoria loam.

MAVERICK COUNTY.

Brackett stony clay loam.
Brennan fine sandy loam and loam (undifferentiated).
Duval loam.
Frio fine sandy loam.
Frio silty clay loam.
Houston loam.
Laredo silt loam.
Maverick loam.
Uvalde gravelly soils.
Uvalde silty clay loam.
Webb fine sandy loam.
Zapata fine sandy loam and loam (undifferentiated).

MEDINA COUNTY.

Blanco silt loam and fine sandy loam (undifferentiated).
Crawford stony clay.
Duval fine sandy loam.
Duval gravelly soils.
Houston black clay.
Houston clay loam.
Houston gravelly soils.
Houston loam.
Norfolk fine sand.
Rough stony land.

San Antonio silty clay loam.
Uvalde gravelly soils.
Uvalde silty clay loam.
Webb fine sandy loam.
Zapata fine sandy loam and loam (undifferentiated),

NUECES COUNTY.

Galveston fine sand.
Lomalta clay.
Nueces fine sand.
Trinity clay.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

REFUGIO COUNTY.

Edna fine sandy loam.
Edna loam.
Lomalta clay.
Lomalta loam.
Lufkin gravelly sandy loam.
Trinity clay.
Trinity fine sandy loam and loam.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

SAN PATRICIO COUNTY.

Lomalta clay.
Nueces fine sand.
Trinity clay.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

STARR COUNTY.

Brennan fine sandy loam.
Brennan loam.
Duval fine sand.
Duval fine sandy loam.
Laredo silt loam.
Nueces fine sand.
Zapata fine sandy loam.

UVALDE COUNTY.

Blanco silt loam and fine sandy loam (undifferentiated).
Brackett stony clay loam.
Crawford stony clay.
Duval loam.
Frio fine sandy loam.
Frio silty clay loam.
Maverick clay loam.

Rough stony land.
San Antonio silty clay loam.
Uvalde gravelly soils.
Uvalde silty clay loam.

VICTORIA COUNTY.

Edna fine sandy loam.
Goliad gravelly sandy loam.
Goliad loam and Houston loam.
Goliad sandy loams.
Lufkin gravelly sandy loam.
Lufkin sands.
Lufkin sandy loams.
Trinity clay.
Trinity fine sandy loam and loam.
Victoria clay.
Victoria fine sandy loam.
Victoria loam.

WEBB COUNTY.

Brennan fine sandy loam.
Duval fine sand.
Duval fine sandy loam.
Houston clay loam.
Houston loam.
Laredo silt loam.
Trinity clay.
Webb clay.
Webb fine sandy loam.
Zapata loam.

WHARTON COUNTY.

Edna clay loam and Victoria clay loam.
Edna fine sandy loam.
Edna loam.
Lufkin sands.
Miller silt loam.
Miller silty clay.
Trinity clay.
Victoria clay.
Victoria loam.

WILLACY COUNTY.

Galveston fine sand.
Nueces fine sand.
Victoria fine sandy loam.

WILSON COUNTY.

Blanco silt loam and fine sandy loam (undifferentiated).
Duval fine sandy loam.
Duval loam.

Frio clay.
Houston clay loam.
Houston loam.
Norfolk fine sand.
Orangeburg fine sand.
Orangeburg fine sandy loam.
Webb fine sandy loam.

ZAPATA COUNTY.

Brennan fine sandy loam.
Duval fine sand.
Laredo silt loam.
Webb fine sandy loam.
Zapata fine sandy loam.

ZAVALA COUNTY.

Duval fine sandy loam.
Duval gravelly soils.
Duval loam.
Frio silty clay loam.
Houston black clay.
Houston gravelly soils.
Maverick clay loam.
Maverick loam.
Uvalde gravelly soils.
Uvalde silty clay loam.
Webb fine sandy loam.
Webb silty clay loam.

DESCRIPTION OF SAMPLES.

ATASCOSA COUNTY.

4727 Norfolk fine sand, 0-12 inches; not cultivated, 3 miles southeast of Poteet.
4728 Norfolk fine sand, 12-36 inches; 3 miles southeast of Poteet.
4737 Duval loam, 0-14 inches; not cultivated, Jourdanton.
4738 Duval loam, 14-36 inches, Jourdanton.
4739 Houston loam, 0-14 inches; never cultivated, 6 miles southeast of Christine.
4740 Houston loam, 14-36 inches, 6 miles southeast of Christine.
4741 Duval fine sandy loam, 0-12 inches, 10 miles southwest of Jourdanton.
4742 Duval fine sandy loam, 12-36 inches, 10 miles southwest of Jourdanton, Bexar county.
1577 San Antonio clay loam, 0-6 inches, 7 miles south of San Antonio.
1578 Subsoil to 1577, depth 6-12 inches.
1579 Norfolk silt loam, depth 0-6 inches; produces one bale cotton per acre, San Antonio.

COMPOSITION OF SOILS.

	ATASCOSA COUNTY								BEXAR COUNTY									
	Norfolk Fine Sand		Duval Loam		Houston Loam		Duval Fine Sandy Loam		San Antonio Clay Loam		Norfolk Silt Loam		Houston Black Clay Loam		Houston Gravelly Clay		Probably Norfolk Fine Sand	
	Surface 4727	Subsoil 4728	Surface 4737	Subsoil 4738	Surface 4739	Subsoil 4740	Surface 4741	Subsoil 4742	Surface 1577	Subsoil 1578	Surface 1579	Subsoil	Surface 1580	Subsoil 1581	Surface 1582	Subsoil 1583	Surface 4310	Subsoil 4311
Per Cent—																		
Phosphoric Acid	.02	.0025	.008	.015	.033	.03	.042	.05	.....	.....	.042	.....	.....	.....	.....	.....	.02	.013
Nitrogen	.025	.013	.083	.065	.055	.047	.087	.062	.028	.050	.031	.....	.107	.092	.093	.082	.033	.022
Potash	.045	.03	.365	.415	.27	.235	.353	.64	.....	.....	.79	.....	.....	.....	.....	.....	.135	.145
Lime	.13	.05	.42	.58	.89	11.16	.22	.26	.....	.....	2.28	.....	.....	.....	.....	.....	.22	.28
Magnesia	.08	.10	.27	.37	.16	.12	.14	.21	.....	.....	.80	.....	.....	.....	.....	.....	.11	.10
Alumina and Oxide of Iron	.31	.35	8.57	11.10	7.51	.832	6.47	14.79	.....	.....	6.02	.....	.....	.....	.....	.....	1.36	1.44
Insoluble and Soluble Silica	98.12	98.84	83.10	78.96	83.11	64.64	87.60	74.77	.....	.....	76.51	.....	.....	.....	.....	.....	96.43	96.44
Loss on Ignition	.84	.40	4.15	4.03	4.25	4.26	3.06	4.72	.....	.....	.....	.....	.....	.....	.....	.....	1.23	.99
Moisture	.18	.06	2.58	3.80	3.63	3.80	1.74	4.14	.....	.....	.....	.....	.....	.....	.....	.....	.35	.38
Parts Per Million—																		
Active Phosphoric Acid	27.5	18.7	7.5	9.4	18.1	5.0	18.1	8.1	40.8	24	87	.....	84	71	31	14	15.6	6.8
Active Potash	80.0	65.0	310.0	220.0	163.7	31.2	567.5	341.2	206.6	108.7	887.0	.....	657.0	315.0	447.0	212.0	206.2	154.2
Acidity	200.	200.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1580 Houston black clay loam, depth 0-6 inches; 5 miles south of San Antonio on Goliad road. Produces 50 bushels corn per acre.

1581 Subsoil to 1580, depth 6-12 inches.

1582 Houston gravelly clay, depth 0-6 inches; virgin; can produce 40 bushels corn per acre; 5 miles south of San Antonio on San Juan road.

1583 Subsoil to 1582, depth 6-12 inches.

4310 Probably Norfolk fine sand, depth 0-12 inches; well drained, moderately fertile upland; in southeast corner of Bexar county; 1 mile northwest from corner; G. K. Cannon's farm; dark brown sandy soil, known as post oak loam; produces one-third bale cotton and 15 to 20 bushels of corn per acre; no fertilizers used; crops are slow in early spring; soil is soggy in wet seasons; crops grow well in dry seasons and soil holds moisture well; it packs, crumbles, does not crack on drying, and washes very little; cultivated 27 years; no green crops have been plowed under; manure gave good results ten years ago; land is run down.

4311 Subsoil to 4310, depth 12-24 inches, light brown sandy soil.

BEE COUNTY.

3363 Probably Goliad sandy loams, depth 0-9 inches; 2½ miles northeast of Beeville; farm of S. A. Wafford; well drained; good rolling upland, producing 20 bushels of corn and one-half bale of cotton per acre; locally known as black land; mesquite grass is native vegetation; soil does not pack; dries into clods; cracks on drying and does not wash; well under-drained; cultivated 12 years.

3364 Subsoil to 3363, depth 9 to 22 inches.

3927 Probably Goliad loam, depth 0-6 inches; half mile south of Tuleto, farm of H. A. Hostetter; well drained; level, fertile upland; known as "snail shell land;" on this spot crops are poor; sticky when wet; does not crack, pack or wash.

3928 Subsoil to 3927, depth 6 to 12 inches.

3929 Probably Goliad loam, depth 0-6 inches; well drained but poor soil on farm of C. C. Schrock, half mile south of Tuleto; sticky when wet; holds moisture well; does not crack; washes a little; cultivated three years; no green crop plowed under; no manure used.

3930 Subsoil to 3929, depth 6-12 inches.

4045 Probably Goliad loam, depth 0-11 inches; rolling; well drained; moderately fertile black clay loam, on Beeville Experiment Station Farm, Beeville 6 miles southwest; known as "chocolate loam" and produces 20 bushels corn per acre; citrus trees turn yellow; no fertilizers; packs a little; dries into clods; cracks widely on drying; washes and dirt washes onto it; cultivated 10 to 12 years; no green crop plowed under; no manure used; considered a good soil.

COMPOSITION OF SOILS—continued.

BEE COUNTY.

	Probably Goliad Sandy Loam		Probably Goliad Loam		Probably Goliad Loam		Probably Goliad Loam		Probably Goliad Loam		Goliad Loam		Beeville Fine Sandy Loam		Galveston Fine Sand	
	Surface 3363	Subsoil 3364	Surface 3927	Subsoil 3928	Surface 3929	Subsoil 3930	Surface 4045	Subsoil 4046	Surface 4047	Subsoil 4048	Surface 3568	Subsoil 3569	Surface 3570	Subsoil 3571	Surface 3578	Subsoil
Per Cent—																
Phosphoric Acid	.02	.017	.055	.055	.058	.053	.02	.022	.032	.136	.02	.02	.023	.020	.022	.....
Nitrogen	.115	.087	.054	.088	.100	.080	.133	.076	.101	.086	.150	.097	.055	.038	.070	.....
Potash	.46	.05	.43	.84	.47	.42	.40	.34	1.31	.31	.40	.46	.22	.28	.16	.....
Lime	.80	.83	5.62	6.24	6.05	7.27	.64	1.00	2.17	6.80	.82	1.16	.35	.43	1.07	.....
Magnesia	.44	.52	.42	.28	.46	.34	.41	.41	.47	.44	.21	.38	.21	.25	.18	.....
Alumina and Oxide of Iron	6.62	9.18	4.73	5.21	5.69	5.49	5.37	7.34	5.32	5.89	6.42	8.55	3.48	6.49	3.30	.....
Insoluble and Soluble Silica	81.87	76.89	79.34	77.15	75.72	75.21	85.94	83.03	83.12	74.11	82.61	78.50	91.95	87.42	91.03	.....
Loss on Ignition	5.00	5.18	4.69	4.67	5.30	4.99	3.81	3.81	4.16	5.74	5.47	4.52	1.96	2.18	2.18	.....
Moisture	4.82	5.98	2.25	2.58	2.60	2.68	2.94	3.47	2.82	3.54	3.79	4.49	1.42	2.82	1.15	.....
Parts Per Million—																
Active Phosphoric Acid	27.1	18.2	140.0	98.8	11.6	42.9	81.2	15.9	89.4	20.6	24.4	10.0	25.0	7.5	11.9	.....
Active Potash	516.5	261.2	515.8	412.2	486.9	269.0	291.7	134.3	290.2	49.3	530.0	365.0	321.2	222.5	140.0	.....
Acidity	0	0	+	+	+	+	0	0	0	0	+	+	0	+	+	.....

4046 Subsoil to 4045, depth 11-23 inches; dark brown with reddish tinge.
4047 Probably Goliad loam, depth 0-12 inches; description same as 4045; cultivated 8 to 10 years.
4048 Subsoil to 4047, depth 12-24 inches.
3568 Goliad loam, depth 0-10 inches; black loam; 2 miles south of Beeville.
3569 Subsoil to 3568, depth 10-36 inches; black sandy clay.
3570 Beeville fine sandy loam, depth 0-12 inches; gray fine sandy loam, half mile south of Beeville.
3571 Subsoil to 3570, depth 12-30 inches; gray sandy clay.
3578 Galveston fine sand; depth 0-10 inches; brown fine sandy loam; five miles north of Beeville.

BRAZORIA COUNTY.

2074 Probably Victoria clay, surface; black heavy clay loam; Angleton.
2075 Probably Victoria clay, surface depth 0-18 inches; black clay; Angleton.
2076 Probably Edna fine sandy loam, surface; black sandy loam; Angleton.
2077 Probably Edna fine sandy loam, surface; brown sandy loam.
2078 Subsoil to 2077, dark brown clay loam.
2079 Probably Victoria clay; black waxy clay; Angleton.
2080 Subsoil to 2079.
3387 Probably Lomalta clay, depth 0-7 inches; good soil; well drained; does not overflow; black clay, known as "big slough soil;" H. J. Klorres, northeast of Velasco; produces 15 to 25 bushels of corn, one-half bale cotton per acre; gets too wet in wet seasons, dries out quickly; soil does not pack much; crumbles and does not crack on drying; washes slightly in heavy rains; crabgrass is the native vegetation; cultivated 17 years; no manure used.
3388 Subsoil to 3387, depth 7-20 inches; brown loam.

CALHOUN COUNTY.

3525 Lomalta clay, depth 0-15 inches; 10 miles south of Port Lavaca.
3529 Subsoil to 3525, depth 16 to 36 inches.
3532 Lomalta fine sandy loam, depth 0-7 inches; 8 miles south of Port Lavaca.
3533 Subsoil to 3532, depth 8 to 36 inches.
3552 Nueces fine sand, depth 0-15 inches; Port O'Connor.
3553 Subsoil to 3552, depth 15-36 inches.
3554 Lomalta clay, depth 0-8 inches; 7 miles southeast of Port Lavaca.
3555 Subsoil to 3554, depth 9-36 inches.

CAMERON COUNTY.

928 Probably Laredo silt loam; Olmito, Texas.
1066 Rio Grande silty clay, 0-12 inches; Brownsville.

COMPOSITION OF SOILS—continued.

	BRAZORIA COUNTY										CALHOUN COUNTY							
	Probably Victoria Clay		Probably Edna Fine Sandy Loam		Probably Edna Fine Sandy Loam		Probably Victoria Clay		Probably Lomalta Clay		Lomalta Clay		Lomalta Fine Sandy Loam		Nueces Fine Sand		Lomalta Clay	
	Surface 2074	Subsoil	Surface 2075	Subsoil 2076	Surface 2077	Subsoil 2078	Surface 2079	Subsoil 2080	Surface 3387	Subsoil 3388	Surface 3525	Subsoil 3529	Surface 3532	Subsoil 3533	Surface 3552	Subsoil 3553	Surface 3554	Subsoil 3555
Per Cent—																		
Phosphoric Acid	.027	.....	.024	.019	.017	.026	.02	.024	.065	.027	.009	.007	.01	.017	.016	.005	.015	.01
Nitrogen	.187	.....	.136	.128	.112	.087	.142	.....	.128	.055	.092	.037	.055	.047	.042	.011	.12	.064
Potash	.33	.....	.37	.27	.20	.42	.43	.62	.37	.82	.50	.11	.25	.72	.07	.07	.50	.55
Lime	.02	.....	.82	.05	.31	.39	.89	1.17	.25	.25	.70	1.29	.12	.39	.08	.05	.46	.46
Magnesia	.55	.....	.57	.33	.25	.34	.57	.83	.53	1.31	.26	.48	.12	.57	.10	.09	.27	.21
Alumina and Oxide of Iron	8.30	.....	.27	6.20	1.70	9.89	11.10	13.83	3.47	10.99	10.87	11.08	2.17	12.43	.56	5.35	9.08	12.15
Insoluble and Soluble Silica	79.41	.....	81.51	85.08	86.56	80.90	76.50	76.09	88.40	78.47	76.29	75.58	94.56	85.63	97.35	95.57	79.97	76.80
Loss on Ignition	.....	.....	.....	.....	.....	.....	.....	.....	4.81	4.12	5.40	4.60	1.79	3.67	1.02	0.21	5.20	4.52
Moisture	.....	.....	.....	.....	.....	.....	.....	.....	1.69	3.02	5.86	5.88	.70	4.92	0.20	0.96	3.81	5.29
Parts Per Million—																		
Active Phosphoric Acid	14.2	.....	24.1	12.57	11.34	6.5	.....	.....	25.1	12.4	11.9	23.1	21.2	8.7	14.4	3.1	15.0	15.6
Active Potash	221.1	.....	164.8	.....	.....	102.4	116.4	.....	140.0	134.1	285.0	216.2	82.5	62.0	150.0	57.5	.....	287.5
Acidity	0	.....	0	0	0	0	0	.....	0	0	.....	0	0	0	.....	.....	.....	.....

COMPOSITION OF SOILS—continued.

	CAMERON COUNTY										DUVAL COUNTY					
	Probably Laredo Silty Loam		Probably Laredo Clay		Nueces Fine Sand		Probably Laredo Silty Loam		Rio Grande Silty Clay		Duval Fine Sand		Duval Fine Sandy Loam		Probably Victoria Fine Sandy Loam	
	Surface 928	Subsoil	Surface 1075	Subsoil 1076	Surface 2325	Subsoil 2326	Surface 3613	Subsoil 3614	Surface 1066	Subsoil	Surface 2364	Subsoil 2365	Surface 2366	Subsoil	Surface 3193	Subsoil 3194
Per Cent—																
Phosphoric Acid	.16		.10	.16	.005	.005	.24	.193	.12		.007	.02	.02		.012	.04
Nitrogen	.19		.20	.15	.028	.025	.28	.106	.07		.052	.050	.070		.103	.085
Potash	.....	.....	.20	1.03	.105	.10	1.07	.955	.90	.....	.361	.55	.68	.....	1.41	1.25
Lime	1.73	.....	8.91	10.01	.10	.08	2.84	9.34	11.20	.....	.15	.22	.33	.....	.82	1.48
Magnesia	1.37	.....	1.94	1.87	.20	.59	.43	.58	1.43	.....	.22	.32	.31	.....	1.31	1.38
Alumina and Oxide of Iron	9.12	.....	13.55	13.13	.85	.76	10.80	10.19	13.34	.....	6.12	6.16	7.28	.....	12.78	11.96
Insoluble and Soluble Silica	.....	.....	51.12	55.49	98.20	98.61	65.80	62.76	53.31	.....	92.84	89.27	86.66	.....	66.34	66.96
Loss on Ignition	7.10	.....	13.11	19.20	.70	.55	8.11	5.99	11.66	.....	1.53	2.49	2.89	.....	17.25	6.19
Moisture	2.61	.....	9.12	5.49	.13	.14	4.35	3.63	5.25	.....	.85	1.50	1.84	.....	10.90	10.22
Parts Per Million—																
Active Phosphoric Acid	38.4	.....	131.	143.6	18.	12.6	7.52	.....	46.	.....	.....	.....	.....	.....	58.	.....
Active Potash	.....	.....	.....	.....	126.	104.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Acidity	0	.....	0	0	0	0	0	—	0	.....	0	0	0	.....	0	0

1075 Probably Lando clay; San Benito.
1076 Subsoil; San Benito.
2325 Nueces fine sand, 0-12 inches; 8 miles east of Sarita.
2326 Nueces fine sand, 12-36 inches.
3613 Probably Laredo silt loam, 0-8 inches; one-half mile from station, Olmito, farm of E. D. Box.
3614 Subsoil to 3613, 8-20 inches.

DEWITT COUNTY.

3375 Probably Goliad sands, depth 0-9 inches; 2½ miles west of Cuero; farm of Fred Ohrt; slightly rolling; moderately fertile; black sandy upland; well drained; does not overflow; produces 25 bushels corn per acre; no fertilizer used; soil does not pack, run together, crack or wash; under-drainage good; cultivated for 12 to 15 years; no green crops ever plowed under; no manure used.
3376 Subsoil to 3375, depth 9-20 inches; dark brown gravelly clay.
3523 Goliad fine sand, depth 0-10 inches; black fine sandy loam; 3½ miles northeast of Yorktown.
3527 Subsoil to 3523, depth 10-26 inches; black fine sand, grading to reddish fine sandy clay.
3530 Goliad fine sandy loam, depth 0-10 inches; black fine sandy loam; 2 miles east of Yorktown.
3535 Subsoil to 3530, depth 10-36 inches; red fine sandy clay, resting on white chalky substance.
3548 Goliad loam, depth 0-10 inches; black-gray loam; 3¼ miles east of Yorktown.
3549 Subsoil to 3548, depth 10-36 inches; red-brown loam, growing more red with depth until white chalky material is reached.
3562 Lufkin sands, depth 0-10 inches; grayish brown fine sand; 9 miles northeast of Cuero.
3563 Subsoil to 3562, depth 10-36 inches; light gray, grading to brownish; trace of small gravel.
3566 Lufkin sandy loam, depth 0-10 inches; gray fine sand, some small gravel; 4½ miles northeast of Cuero.
3567 Subsoil to 3566, depth 10-36 inches; yellow fine sandy clay, grading to red.
3574 Houston fine sandy loam, depth 0-6 inches; black fine sandy loam; half mile west of Lindemon.
3575 Subsoil to 3574, depth 6-36 inches; black clay grading to white chalky clay.
3576 Houston loam, depth 0-10 inches; black loam containing small white shells; 8 miles north of Cuero.
3577 Subsoil to 3576, depth 10-36 inches; black silty clay, grading to dark gray clay.
3606 Trinity clay, depth 0-10 inches; black clay loam; Guadalupe bottom; produces 50 to 60 bushels corn; one bale cotton, 25 tons cane; level; occasional overflow; 4 miles northwest of Cuero.
3607 Subsoil to 3606, depth 10-36 inches; black clay loam.

COMPOSITION OF SOILS—continued.

DE WITT COUNTY

	Probably Goliad Sands		Goliad Sand		Goliad Sandy Loam		Goliad Loam		Lufkin Sands		Lufkin Sandy Loam		Houston Fine Sandy Loam		Houston Loam		Trinity Clay		Probably Trinity Fine Sandy Loam	
	Surface 3375	Subsoil 3376	Surface 3523	Subsoil 3527	Surface 3530	Subsoil 3535	Surface 3548	Subsoil 3549	Surface 3562	Subsoil 3563	Surface 3566	Subsoil 3567	Surface 3574	Subsoil 3575	Surface 3576	Subsoil 3577	Surface 3606	Subsoil 3607	Surface 5947	Subsoil 5948
Per Cent—																				
Phosphoric Acid	.02	.005	.02	.003	.023	.002	.026	.022	.017	.01	.024	.043	.017	.....	.067	.058	.157	.128	.073	.063
Nitrogen	.035	.148	.039	.024	.081	.043	.151	.074	.034	.018	.048	.034	.054	.....	.133	.053	.200	.125	.066	.052
Potash	.14	.47	.17	.34	.46	.52	.54	.77	.05	.19	.20	.23	.225	.....	.60	.59	.62	.52	.295	.275
Lime	.....	.....	.11	.25	1.07	1.98	7.37	12.34	.20	.09	.12	.14	.34	.....	3.56	7.15	10.22	10.14	.88	3.70
Magnesia	.10	.46	.10	.26	.35	.50	.81	.27	.06	.08	.07	.13	.17	.....	.52	.44	3.57	4.53	.14	.13
Alumina and Oxide of Iron	1.72	10.34	1.04	3.45	6.00	9.37	9.40	11.87	.74	.70	.77	10.11	3.89	.....	10.96	12.62	8.56	7.69	3.99	4.00
Insoluble and Soluble Silica	96.09	77.84	97.38	93.55	86.45	79.19	67.01	54.49	97.51	97.41	97.47	84.39	91.83	.....	71.30	63.59	53.42	49.13	87.63	93.27
Loss on Ignition	1.26	4.41	1.05	1.42	3.31	3.08	7.15	5.29	1.24	.63	1.38	3.95	2.38	.....	6.49	6.50	10.21	8.83	.238	2.29
Moisture	.57	5.09	.32	1.08	1.85	3.61	3.55	4.25	.14	.09	.15	1.47	1.09	.....	3.81	4.66	3.09	2.65	2.23	2.65
Parts Per Million—																				
Active Phosphoric Acid	23.4	22.9	14.4	11.3	27.5	12.5	16.9	9.4	18.1	8.8	20.6	1.9	.....	.....	125.6	6.8	87.6	45.3	204.4	195.0
Active Potash	124.7	108.2	.....	136.2	277.5	51.0	213.5	281.2	105.0	78.7	76.2	140.0	.....	.....	461.2	78.7	269.0	178.5	263.7	131.2
Acidity	0	0	0	0	0	.....	—	—	0	.....	.....	0	.....	.....	—	—	—	—	0	0

5947 Probably Trinity fine sandy loam, depth 0-12 inches; 2½ miles south of Thomaston on Guadalupe river; moderate, black sandy loam; known as "valley loam" and subject to overflow; produces 15 bushels corn and one-third bale of cotton per acre. Native vegetation is sedge grass; water penetrates the soil readily and the surface dries quickly; stands drought well when thoroughly cultivated; dries into clods; when packed, clods take a long time to disintegrate; dirt does not wash onto it; cultivated 15 years; no green crop plowed under; no manure used.

5948 Subsoil to 5947, depth 12-24 inches; black sandy soil.

DIMMIT COUNTY.

3198 Probably Webb fine sandy loam, depth 0-15 inches; Weil Bros., Carrizo Springs.

3199 Subsoil to 3198, depth 15-20 inches.

3391 Probably Webb fine sandy loam, depth 0-12 inches; fertile; brown sandy loam; 1½ miles west of Asherton, on farm of Roy Fletcher; 150 yards southeast of flowing well; north half section, Survey 8 of I. & G. N. Ry.; vegetable and forage crops grown; no fertilizers; boggy in some places in wet weather; holds moisture well if cultivated; runs together, dries into clods, cracks into small cracks on drying; good surface drainage; washes very little, but dirt washes onto it in some places; cultivated since 1909; no green crop plowed under and no manure has been used; sample taken from place where native vegetation would not grow.

3392 Subsoil to 3391, depth 12-22 inches; brown loam.

DUVAL COUNTY.

2364 Duval fine sand, 0-8 inches; Hebbronville.

2365 Duval fine sand, 8-26 inches; Hebbronville.

2366 Duval fine sandy loam, 0-18 inches; 3½ miles north of San Diego.

3193 Probably Victoria fine sandy loam, 0-12 inches; Benavides.

3194 Subsoil to 3193, 12-24 inches.

4673 Maverick loam, depth 0-15 inches; five miles southeast of Carrizo Springs.

4674 Maverick loam, depth 0-10 inches; five miles southeast of Carrizo Springs.

4675 Maverick clay loam, depth 0-12 inches; three miles southeast of Carrizo Springs.

4676 Duval fine sand, light brown, fine to medium sand to several feet.

4717 Zapata fine sandy loam, depth 0-8 inches; Carrizo Springs.

FRIO COUNTY.

3182 Probably Duval fine sandy loam, depth 0-3 inches; slopes east; one mile north of I. & G. N. depot, Pearsall, Texas; known as Owingo field; poor land; well drained; produces one-fourth

COMPOSITION OF SOILS—continued.

	DIMMIT COUNTY														FRIO COUNTY			
	Probably Webb Fine Sandy Loam		Probably Webb Fine Sandy Loam		Maverick Loam		Maverick Loam		Maverick Clay Loam		Duval Fine Sand		Zapota Fine Sandy Loam		Probably Duval Fine Sandy Loam		Duval Fine Sandy Loam	
	Surface 3198	Subsoil 3199	Surface 3391	Subsoil 3392	Surface 4673	Subsoil	Surface 4674	Subsoil	Surface 4675	Subsoil	Surface 4676	Subsoil	Surface 4717	Subsoil	Surface 3182	Subsoil	Surface 4678	Subsoil 4679
Per Cent—																		
Phosphoric Acid	.015	.015	.052	.037	.075	.....	.054	.....	.035	.....	.075	.....	.107	.....	.012	.....	.033	.049
Nitrogen	.054	.045	.048	.038	.113	.....	.111	.....	.076	.....	.017	.....	.054	.....	.038	.....	.031	.049
Potash	.52	.14	.40	.39	.80	.....	.80	.....	.37	.....	.20	.....	.340	.....	.42	.....	.25	.42
Lime	.28	.12	.21	2.56	.27	.....	2.43	.....	.52	.....	.54	.....	11.52	.....	.14	.....	.38	.17
Magnesia	.72	.36	.39	.85	.26	.....	.34	.....	.24	.....	.15	.....	2.15	.....	.16	.....	.14	.18
Alumina and Oxide of Iron	5.80	1.40	7.56	8.57	8.51	.....	8.81	.....	7.21	.....	.85	.....	4.06	.....	4.30	.....	3.98	7.60
Insoluble and Soluble Silica	86.54	96.75	84.62	79.19	78.87	.....	77.10	.....	84.48	.....	96.39	.....	65.32	.....	92.96	.....	92.71	83.73
Loss on Ignition	3.62	1.43	3.15	4.39	4.90	.....	.....	.....	3.93	.....	1.19	.....	6.19	.....	.175	.....	1.67	1.31
Moisture	1.88	.50	2.26	2.78	2.76	.....	.....	.....	2.87	.....	.39	.....	.43	.....	.84	.....	.57	3.66
Parts Per Million—																		
Active Phosphoric Acid	.....	.....	32.6	44.7	265.	.....	267.5	.....	63.2	.....	14.4	.....	136.9	.....	15.9	.....	5.0	2.8
Active Potash	.....	.....	209.4	163.5	1355.0	.....	1325.0	.....	218.8	.....	138.1	.....	236.2	.....	235.3	.....	219.4	281.9
Acidity	0	.....	+	0	0	.....	0	.....	0	.....	0	.....	0	.....	0	.....	0	0

bale of cotton per acre; red soil; hard to manage in dry weather; does not pack when wet; represents 20 acres on farm.

4678 Duval fine sandy loam, depth 0-18 inches; 1½ miles west of Pearsall.

4679 Subsoil to 4678, depth 18-36 inches.

GOLIAD COUNTY.

3538 Goliad loam, depth 0-14 inches; black heavy loam; 7 miles northwest of Goliad.

3539 Subsoil to 3538, depth 14-36 inches; brown clay, containing white spots.

3550 Lufkin sandy loams, depth 0-12 inches, gray fine sand containing coarse quartz fragments; 5 miles south of Goliad.

3551 Subsoil to 3550, depth 12-36 inches; mottled gray and yellow sandy clay.

HIDALGO COUNTY.

2230 Probably Brennan fine sandy loam, 0-11 inches; farm of A. R. LaRue, McAllmer, Texas.

2231 Subsoil to 2230.

2956 Probably Brennan fine sandy loam, 0-10 inches; Thos. M. Plummer, Mercedes.

2957 Subsoil to 2956, 10-20 inches.

2371 Probably Laredo clay, 0-6 inches; J. P. Norwood, 4½ miles south of Donna.

3372 Subsoil to 3371, 6-16 inches.

JACKSON COUNTY.

5707 Probably Victoria clay, depth 0-8 inches; level; fairly well drained; black clay; one mile southeast of Ganado, farm of Henry Halvarsen; known locally as "black hog-wallow land;" produces 670 lbs. of seed cotton on 3 acres; no fertilizers used; native vegetation is crab grass; dries slowly in wet seasons; gets hard and cracks deeply in dry; poor under-drainage; does not wash; no green crop ever plowed under and no manure used.

5708 Subsoil to 5707, depth 8-16 inches; black clay.

KARNES COUNTY.

3369 Probably Houston loam, depth 0-10 inches; dark clay loam; one-half mile west of Panna Maria, farm of V. S. Kowalik; moderate rolling, dark loam; known as "yellow sandy loam;" produces 100 lbs. cotton and 5 bushels corn per acre; no fertilizers used; native vegetation Concho grass; seems to produce less in wet seasons; soil does not pack or crack; crumbles, washes a little, but dirt does not wash onto it; cultivated 30 years; no green crop plowed under; 2 tons of manure per acre gave moderate results, but the crops burned in dry weather.

COMPOSITION OF SOILS—continued.

	GOLIAD COUNTY				HIDALGO COUNTY						JACKSON COUNTY	
	Goliad Loam		Lufkin Sandy Loam		Probably Brennan Fine Sandy Loam		Probably Brennan Fine Sandy Loam		Probably Laredo Clay		Probably Victoria Clay	
	Surface 3538	Subsoil 3539	Surface 3550	Subsoil 3551	Surface 2230	Subsoil 2231	Surface 2956	Subsoil 2957	Surface 3371	Subsoil 3372	Surface 5707	Subsoil 5708
Per Cent—												
Phosphoric Acid	.025	.017	.007	.007	.045	.035	.....	.....	.162	.122	.....	.....
Nitrogen	.140	.075	.030	.059	.117	.039	.115	.067	.159	.120	.096	.061
Potash	.62	.61	.07	.32	.80	.83	.....	.....	1.23	1.16	.29	.29
Lime	.81	5.82	.09	.29	.50	2.21	.....	.....	12.01	14.83	.69	.44
Magnesia	.42	.64	.07	.37	.61	.78	.....	.....	2.84	.148	.23	.27
Alumina and Oxide of Iron	7.49	9.04	.59	10.60	7.14	8.29	.....	.....	12.07	12.07	.....	.....
Insoluble and Soluble Silica	81.52	71.11	97.66	80.88	74.47	80.18	.....	.....	46. 72	45.84	82.35	82.5
Loss on Ignition	6.07	5.77	.85	3.46	.....	.....	.....	.....	13.99	13.92	4.75	4.04
Moisture	4.09	3.74	.32	3.96	.....	.....	.....	.....	5.13	5.84	3.87	4.04
Parts Per Million—												
Active Phosphoric Acid	59.4	17.5	5.6	.....	71.9	68.7	352.6	237.0	38.8	43.0	13.8	3.1
Active Potash	575.0	136.2	20.0	.....	.....	.....	629.4	500.0	382.3	271.8	78.7	108.7
Acidity	—	—	0	0	0	.....	.....	.....	—	—	0	0

3370 Subsoil to 3369, depth 10-18 inches; dark clay.
3524 Houston loam; depth 0-12 inches; black loam; 5 miles northeast of Helena.
3528 Subsoil to 3524, depth 12-30 inches; black clay loam.
3531 Houston loam, depth 0-10 inches; black clay loam; 4 miles south of Riddleville.
3534 Subsoil to 3531, depth 10-36 inches; black and gray clay.
3556 Goliad sandy loams, depth 0-10 inches; dark brown fine sandy loam; 2½ miles east of Green.
3557 Subsoil to 3556, depth 10-30 inches; red sandy clay.
3564 Duval sandy loams, depth 0-10 inches; reddish brown fine sandy loam; 5 miles northeast of Runge.
3565 Subsoil to 3564, depth 10-36 inches; red sandy clay.

LA SALLE COUNTY.

4632 Frio loam, depth 0-16 inches; 8 miles southeast of Cotulla.
4633 Subsoil to 4632, depth 16-30 inches.
4634 Frio clay, depth 0-14 inches; 12 miles southeast of Cotulla.
4635 Subsoil to 4634, depth 14-30 inches.
4636 Houston loam, depth 0-10 inches; 7 miles east of Cotulla.
4637 Houston loam, depth 10-36 inches.
4638 Houston clay loam, depth 0-12 inches; 8½ miles east of Cotulla.
4639 Subsoil to 4638, depth 12-30 inches.

LIVE OAK COUNTY.

4653 Frio fine sandy loam, depth 0-16 inches; 5 miles southwest of Oakville.
4654 Subsoil to 4653, depth 16-36 inches.

MATAGORDA COUNTY.

1266 Probably Victoria clay, depth not given; rice soil; Bay City.
2233 Probably Edna fine sandy loam, depth 0-15 inches; moderately fertile; well drained; light brown sandy clay soil on farm of F. P. Lund, Midfields; soil is soft in wet seasons and very dry in dry seasons.
2234 Subsoil to 2233, depth 15-24 inches; dark brown very fine sand.
2236 Probably Edna loam, depth 0-4 inches; moderately fertile, well drained soil on Katayama farm, Markham; produces 18 barrels rice per acre; rice is the principal crop.
3161 Probably Edna fine sandy loam, depth 0-6 inches; moderately fertile; poorly drained, sandy loam, on farm of S. W. Marjarum, Palacios; breaks up easily when wet; runs together.
3162 Subsoil to 3161, depth 6-15 inches; clay.
3546 Edna loam, depth 0-10 inches; 2 miles north of Blessing.
3547 Subsoil to 3546, depth 10-36 inches.
3560 Edna fine sandy loam, depth 0-16 inches; 2 miles north of Blessing.
3561 Subsoil to 3560, depth 16-36 inches.

COMPOSITION OF SOILS—continued.

	KARNES COUNTY										LA SALLE COUNTY							
	Probably Houston Loam		Houston Loam		Houston Loam		Goliad Sandy Loam		Duval Sandy Loam		Frio Loam		Frio Silty Clay Loam		Houston Loam		Houston Clay Loam	
	Surface 3369	Subsoil 3370	Surface 3524	Subsoil 3528	Surface 3531	Subsoil 3534	Surface 3556	Subsoil 3557	Surface 3564	Subsoil 3565	Surface 4632	Subsoil 4633	Surface 4634	Subsoil 4635	Surface 4636	Subsoil 4637	Surface 4638	Subsoil 4639
Per Cent—																		
Phosphoric Acid	.072	.032	.015	.007	.012	.002	.020	.015	.025	.033	.063	.055	.173	.133	.051	.063	.113	.103
Nitrogen	.058	.043	.146	.075	.085	.079	.086	.069	.044	.073	.082	.067	.195	.148	.108	.086	.074	.078
Potash	.34	.33	.47	.39	.61	.57	.285	.35	.74	.36	.54	.44	.89	.875	.318	.34	.975	1.105
Lime	5.47	12.28	.69	.75	3.86	3.51	.57	.48	.26	.42	2.61	2.68	2.24	6.70	2.93	9.76	2.99	4.27
Magnesia	.42	.43	.53	.50	.46	1.21	.09	.18	.16	.27	.30	.18	.34	.19	.26	.22	.37	.24
Alumina and Oxide of Iron	5.14	4.63	5.65	7.49	11.58	11.03	5.67	7.55	3.00	9.74	6.33	5.58	11.02	11.35	7.82	8.10	15.81	15.47
Insoluble and Soluble Silica	82.49	67.57	84.01	82.34	67.81	86.19	87.09	82.46	94.19	82.15	82.91	84.26	72.86	66.32	78.17	65.90	63.79	59.31
Loss on Ignition	4.86	7.63	4.84	4.27	7.51	6.56	3.48	5.75	1.65	3.98	3.59	2.66	6.47	5.61	5.42	7.30	7.19	7.04
Moisture	1.44	1.52	3.26	4.19	6.82	6.80	1.83	1.46	.52	2.60	2.22	2.10	4.33	4.19	3.72	3.55	6.91	6.73
Parts Per Million—																		
Active Phosphoric Acid	13.2	30.9	28.1	11.9	.....	31.2	12.5	.....	36.3	2.5	14.50	14.06	523.1	125.0	71.3	11.3	367.5	357.5
Active Potash	367.0	156.4	587.5	218.7	.....	73.0	208.7	.....	190.0	97.5	651.2	413.7	742.5	151.2	175.0	50.0	705.0	656.2
Acidity	—	—	—	—	—	—	0	0	.....	.....	0	0	0	0	0	.....	0	0

COMPOSITION OF SOILS—continued.

	LIVE OAK COUNTY		MATAGORDA COUNTY													
	Frio Fine Sandy Loam		Probably Victoria Clay		Probably Edna Fine Loam		Probably Edna Loam		Probably Edna Fine Sandy Loam		Edna Loam		Edna Fine Sandy Loam		Galveston Fine Sand	
	Surface 4653	Subsoil 4654	Surface 1335	Subsoil	Surface 2233	Subsoil 2234	Surface 2236	Subsoil	Surface 3161	Subsoil 3162	Surface 3546	Subsoil 3547	Surface 3560	Subsoil 3561	Surface 3579	Subsoil
Per Cent—																
Phosphoric Acid	.04	.05	.03	.....	.007	.017	.05	.....	.027	.027	.013	.007	.022	.045	.035	.....
Nitrogen	.042	.044	.096	.....	.070	.068	.069	.....	.106	.062	.109	.052	.069	.390	.008	.....
Potash	.39	.41	.82	.....	.40	.16	.885	.....	.42	.58	.25	.68	.17	.55	.045	.....
Lime	.87	1.95	.89	.....	.54	.28	2.02	.....	.28	.35	.26	.41	.17	.43	.33	.....
Magnesia	.18	.21	1.04	.....	.40	.22	.49	.....	.19	.43	.25	.63	.13	.49	.10	.....
Alumina and Oxide of Iron	4.84	5.76	17.87	.....	8.90	3.50	8.85	.....	6.21	9.90	3.83	11.34	2.06	11.20	.89	.....
Insoluble and Soluble Silica	89.43	86.06	68.13	.....	84.23	91.16	79.94	.....	86.56	81.33	89.75	78.97	94.87	77.74	98.15	.....
Loss of Ignition	1.37	1.96	7.99	.....	2.98	4.74	3.73	.....	4.20	4.13	4.06	4.38	2.29	3.67	0.25	.....
Moisture	1.89	2.30	3.93	.....	3.17	1.33	3.25	.....	2.21	3.45	1.34	4.18	.51	4.27	.08	.....
Parts Per Million—																
Active Phosphoric Acid	130.0	107.5	.....	.....	40.6	21.5	28.7	.....	26.3	50.6	11.3	3.1	.....	3.1	140.0	.....
Active Potash	526.2	337.5	.....	.....	159.0	122.8	293.7	.....	150.6	137.6	195.0	240.0	.....	216.2	40.0	.....
Acidity	0	.....	0	.....	0	200.	0	.....	0	0	0	.....	—	—	0	.....

3579 Galveston fine sand, depth not given; 4 miles south of lighthouse on Matagorda Island.

MEDINA COUNTY.

4729 Houston black clay, depth 0-15 inches; 8 miles northwest of Hondo.
4730 Houston black clay, depth 18-36 inches; 8 miles northwest of Hondo.
4731 Houston clay loam, depth 0-12 inches; 2 miles south of Lacoste.
4732 Subsoil to 4731, depth 12-36 inches.
4733 San Antonio silty clay loam, depth 0-10 inches; cultivated 2 years; 4 miles south of Hondo, on W. B. Odem's farm.
4734 Subsoil to 4733, depth 10-36 inches.
4735 Blanco silt loam, depth 0-12 inches; cultivated several years to cotton and corn; one mile west of Rio Medina.
4736 Subsoil to 4735, depth 12 inches to 36 inches.
4743 Webb fine sandy loam, depth 0-12 inches; 4 miles northwest of Yancey.
4744 Subsoil to 4743, depth 12 inches to 36 inches.

NUECES COUNTY.

990 Probably Nueces fine sand, 0-15 inches; Riveria.
991 Subsoil to 990, 15-36 inches.
1200 Nueces fine sand, 0-15 inches; one mile west of Flowers Bluff.
1201 Subsoil to 1200, 15-36 inches.
1202 Victoria clay, 0-10 inches.
1203 Subsoil to 1202, 10-36 inches.
1204 Victoria loam, 0-12 inches.
1205 Subsoil to 1204, 12-36 inches.
1206 Victoria fine sandy loam, 0-15 inches.
1207 Subsoil to 1206, 15-36 inches.
2316 Victoria loam, 0-18 inches; Kingsville.
2317 Subsoil to 2316, 18-36 inches.
2318 Lomalta clay, 0-12 inches; 16 miles southeast of Kingsville.
2319 Subsoil to 2318, 12-36 inches.
2322 Victoria fine sandy loam, 0-24 inches; 3 miles north of Riveria.
2323 Subsoil to 2322, 24-36 inches.
2479 Houston loam, 0-18 inches; 10 miles north of Alice.
2480 Subsoil to 2479, 18-36 inches.

REFUGIO COUNTY.

3522 Victoria clay, depth 0-12 inches; one-half mile northeast of Tiroli.
3526 Subsoil to 3522, depth 12-36 inches.
3558 Victoria fine sandy loam, depth 0-14 inches; one mile northwest of Woodsboro.
3559 Subsoil to 3558.

COMPOSITION OF SOILS—continued.

	MEDINA COUNTY										REFUGIO COUNTY				SAN PATRICIO COUNTY	
	Houston Black Clay		Houston Clay Loam		San Antonio Silty Clay Loam		Blanco Silt Loam		Webb Fine Sandy Loam		Victoria Clay		Victoria Fine Sandy Loam		Victoria Clay	
	Surface 4729	Subsoil 4730	Surface 4731	Subsol 4732	Surface 4733	Subsoil 4734	Surface 4735	Subsoil 4736	Surface 4743	Subsoil 4744	Surface 3522	Subsoil 3526	Surface 3558	Subsoil 3559	Surface 2313	Subsoil 2314
Per Cent—																
Phosphoric Acid	.072	.06	.038	.028	.06	.025	.064	.059	.033	.048	.027	.....	.01	.01	.04	.011
Nitrogen	.097	.043	.061	.032	.126	.060	.062	.042	.039	.038	.111	.....	.083	.055	.150	.084
Potash	.735	.64	.915	.95	1.21	1.03	.41	.350	.175	.50	.79	.....	.11	.28	.80	.60
Lime	1.51	2.76	.66	.70	6.40	11.79	37.94	39.18	.21	.40	2.03	.....	.28	.37	2.81	4.19
Magnesia	.27	.23	.27	.32	.40	.41	.16	.14	.12	.16	1.32	.....	.15	.21	.99	1.47
Alumina and Oxide of Iron	15.86	15.87	13.63	14.20	12.04	12.63	4.80	4.41	3.64	14.28	14.29	.....	3.03	7.93	11.32	11.31
Insoluble and Soluble Silica	63.66	60.76	73.03	71.71	59.60	54.08	18.24	16.59	93.01	73.54	65.51	.....	92.14	84.01	70.04	69.22
Loss on Ignition	9.53	7.27	5.43	5.01	8.37	9.38	9.84	3.80	1.91	5.20	9.02	.....	2.89	3.16	8.10	7.13
Moisture	7.90	9.06	5.31	6.60	4.93	5.12	1.76	1.58	.66	3.40	8.04	.....	1.31	3.35	5.32	5.30
Parts Per Million—																
Active Phosphoric Acid	124.4	135.6	19.4	.....	30.6	5.0	11.8	8.8	15.0	3.1	.....	.....	11.3	6.3	.....	.....
Active Potash	655.0	382.5	840.0	.....	730.0	178.7	158.7	121.2	282.5	270.0	.....	.....	51.2	72.5	.....	.....
Acidity	0	0	0	0	0	0	0	0	0	0	0	.....	.....	.....	.....	.....

COMPOSITION OF SOILS—continued.

	NUECES COUNTY																	
	Probably Nueces Fine Sand		Nueces Fine Sand		Victoria Clay		Victoria Loam		Victoria Fine Sandy Loam		Victoria Loam		Lemarto Clay		Victoria Fine Sandy Loam		Houston Loam	
	Surface 990	Subsoil 991	Surface 1200	Subsoil 1201	Surface 1202	Subsoil 1203	Surface 1204	Subsoil 1205	Surface 1206	Subsoil 1207	Surface 2316	Subsoil 2317	Surface 2318	Subsoil 2319	Surface 2322	Subsoil 2323	Surface 2479	Subsoil 2480
Per Cent—																		
Phosphoric Acid	.08	.02	.01	.04	.04	.04	.03	.03	.02	.02	.026	.027	.015	.01	.021	.015	.02	.016
Nitrogen	.04	.001	.024	.026	.066	.060	.10	.05	.050	.035	.110	.054	.071	.033	.045	.045	.078	.054
Potash	.17	.71	.08	.05	.65	.62	.37	.28	.18	.41	.84	.77	1.15	1.20	.13	.67	.46	.48
Lime	.07	.24	.06	.06	2.35	1.35	.85	1.02	.17	.38	2.63	7.48	.26	5.94	.21	.41	.56	.55
Magnesia	.80	.55	.07	.08	1.39	1.26	.35	.67	.11	.42	.80	.99	.71	.14	.29	.10	.52	.42
Alumina and Oxide of Iron	1.58	10.29	0.67	.66	13.81	14.16	5.71	6.64	1.93	8.06	8.22	8.33	7.28	6.30	2.58	6.84	5.57	6.86
Insoluble and Soluble Silica	96.25	78.45	98.58	98.94	62.86	66.75	86.11	83.17	95.25	84.33	72.52	70.36	76.24	65.82	94.52	86.74	87.42	85.42
Loss on Ignition	1.27	4.40	.60	.28	8.10	7.22	4.00	3.65	1.50	2.02	6.15	5.72	4.22	6.57	.56	3.20	3.41	3.09
Moisture	.84	5.23	.09	.12	7.25	6.48	.251	2.81	.83	2.84	3.69	3.51	4.39	5.31	.68	1.80	1.87	2.03
Parts Per Million—																		
Active Phosphoric Acid	1.5	0.9	10.5	10.0	192.0	103.0	157.0	60.0	139.0	26.0	1.9	.....	.....	21.2	.....	.....	29.4	.....
Active Potash	.....	.....	70.0	.....	737.0	601.0	326.0	241.0	364.0	252.0	641.2	.....	.....	415.0	.....	.....	502.5	.....
Acidity	0	0	0	0	0	.....	0	0	0	0	—	—	0	.....	0	0	0	0

SAN PATRICIO COUNTY.

2313 Victoria clay, 0-18 inches; 2 miles northeast of Taft.
2314 Subsoil to 2313, 18-36 inches.

UVALDE COUNTY.

4691 Frio silty clay loam, depth 0-10 inches; virgin; 4 miles southeast of Uvalde.
4692 Subsoil to 4691, depth 10-36 inches.
4693 Duval loam, depth 0-10 inches; virgin; 15 miles southeast of Uvalde.
4694 Subsoil to 4693, depth 10-36 inches.
4695 Uvalde silty clay loam, depth 0-10 inches; 12 miles south of Uvalde.
4696 Subsoil to 4695, depth 10-36 inches.
4697 Frio fine sandy loam, depth 0-12 inches; 12 miles southeast of Uvalde.
4698 Subsoil to 4697, depth 12-36 inches.

VICTORIA COUNTY.

2368 Probably Victoria fine sandy loam, surface soil; dark brown sandy loam; Nursery, Texas.
2369 First subsoil to 2368, red fine sandy loam.
2370 Second subsoil to 2368, red and gray mottled clay.
2371 Soil from central portion of large hill of cutting ants; gray sandy loam, supposed to be a mixture of 2368, 2369 and 2370 by ants.
3536 Victoria clay, depth 0-12 inches; black clay loam; 3 miles northeast of Victoria.
3537 Subsoil to 3536, depth 12-36 inches; dark gray clay loam.
3572 Victoria loam, depth 0-8 inches; dark brown heavy loam; 5 miles northeast of Victoria.
3573 Subsoil to 3572, depth 8-36 inches; dark gray heavy clay loam.

WEBB COUNTY.

2870 Probably Laredo silt loam, 0-8 inches; W. A. Cone, Laredo.
2871 Subsoil to 2870.
4212 Probably Laredo silt loam; 6 miles south of Laredo on the Rio Grande.
4213 Subsoil to 4212.
4940 Probably Laredo silt loam, 0-12 inches.
4941 Subsoil to 4940, 12-24 inches.

WHARTON COUNTY.

2191 Surface soil; maybe Edna loam, depth 0-6 inches; farm of M. P. Jensen, El Campo; fertile, level, well drained black clay; gets hard in dry seasons.
2192 Subsoil to 2191, depth 6-24 inches.

COMPOSITION OF SOILS—continued.

	UVALDE COUNTY								VICTORIA COUNTY						ZAVALA COUNTY			
	Frio Silty Clay Loam		Duval Loam		Uvalde Silty Clay Loam		Frio Fine Sandy Loam		Probably Victoria Fine Sandy Loam		Victoria Clay		Victoria Loam		Red Clay Loam		Black Sandy Soil	
	Surface 4691	Subsoil 4692	Surface 4693	Subsoil 4694	Surface 4695	Subsoil 4696	Surface 4697	Subsoil 4698	Surface 2368	Subsoil 2369	Surface 3536	Subsoil 3537	Surface 3572	Subsoil 3573	Surface 1277	Subsoil 1278	Surface 1279	Subsoil
Per Cent—																		
Phosphoric Acid	.088	.083	.013	.03	.083	.083	.06	.06	.012	.012	.017	.002	.013	.018	.10	.13	.05	.....
Nitrogen	.173	.095	.045	.057	.130	.077	.081	.068	.058	.046	.11	.051	.064	.055	.10	.07	.15	.....
Potash	.85	.93	.22	.335	.58	.57	.40	.39	.19	.25	.35	.37	.565	.79	.48	.54	.48	.....
Lime	8.82	11.17	.23	.25	9.59	11.04	3.61	6.11	.19	.23	.57	.58	.46	.52	7.15	11.74	.81	.....
Magnesia	.33	1.99	.18	.19	1.72	3.85	.26	.22	.13	.22	.43	.50	.22	.13	15.76	12.67	.50	.....
Alumina and Oxide of Iron	10.85	11.59	4.65	7.95	7.22	8.18	5.03	5.68	.....	7.27	7.87	9.44	4.75	6.96	6.05	5.87	6.94	.....
Insoluble and Soluble Silica	61.27	53.89	91.37	85.98	63.88	55.21	82.95	77.83	96.07	72.90	81.77	80.54	88.51	86.03	33.07	33.42	82.36	.....
Loss on Ignition	7.17	6.97	1.13	3.40	7.02	4.27	3.41	4.43	1.54	2.95	5.01	3.99	4.11	3.19	9.48	10.82	5.28	.....
Moisture	3.63	4.08	2.08	2.30	2.39	5.13	1.88	2.16	.44	1.56	3.55	4.31	2.47	2.81	1.82	2.06	2.77	.....
Parts Per Million—																		
Active Phosphoric Acid	23.1	7.5	8.1	3.8	21.4	9.4	131.2	93.1	10.0	5.6	15.0	5.6	23.1	10.0	29.4	.....	.....	.....
Active Potash	753.7	197.5	201.2	216.2	290.0	117.5	118.7	198.7	94.9	117.1	140.0	178.7	132.5	80.0	.....	.....	.....	.....
Acidity	0	0	0	0	0	—	0	0	0	200	0	0	0	0	.....	.....	.....	.....

3237 Miller silt loam, depth 0-15 inches; light reddish brown silt loam; 3 miles southeast of Wharton.
3238 Subsoil to 3237, depth 15-36 inches; light brown silt loam with some very fine sand.
3239 Miller silty clay, depth 0-14 inches; reddish brown silt clay; one mile north of Iago.
3240 Subsoil to 3239, depth 14-32 inches; reddish brown silty clay loam.
3540 Trinity clay, depth 0-14 inches; black clay; 3 miles southeast of Wharton.
3541 Subsoil to 3540, depth 15-36 inches; dark drab clay.
3542 Pledger silt loam, depth 0-10 inches; black silt loam; 2½ miles northeast of Don Tal.
3543 Subsoil to 3542, depth 10-36 inches; yellowish brown silt clay.
3544 Victoria clay, depth 0-10 inches; black heavy clay; 7 miles southeast of El Campo.
3545 Subsoil to 3544, depth 11-36 inches; dark heavy clay.

WILSON COUNTY.

5908 Probably Duval fine sandy loam, depth 0-8 inches; produces one-half bale cotton, 25 bushels corn; three-fourths mile east of Floresville on farm of Mrs. G. B. Wiseman; known locally as "red sandy loam;" fairly good upland; between San Antonio and Corpus road and S. A. & A. P. R. R.; very little fertilizer used; crops: cotton, corn and melons; packs some in wet seasons and crops grow slowly; stands drought well; crumbles if worked after rains; dries into clods if not worked often; does not wash; cultivated 6 or 7 years; crust forms if not stirred; holds moisture well if not cultivated.
5909 Subsoil to 5908, depth 8 to 20 inches; brown sandy soil.

ZAVALA COUNTY.

1277 Surface soil; depth 0-12 inches; virgin; reddish brown clay loam; level; fair drainage; native vegetation, mesquite, chaparral, prickly pear.
1278 Subsoil to 1277, depth 12 to 24 inches.
1279 Surface soil; black sandy land; onions grow well on it; from near Crystal City.

COMPOSITION OF SOILS—continued.

	WEBB COUNTY						WHARTON COUNTY												WILSON COUNTY	
	Probably Laredo Silt Loam		Probably Laredo Silt Loam		Probably Laredo Silt Loam		Probably Edna Loam		Miller Silt Loam		Miller Silty Clay		Trinity Clay		Pledger Silt Loam		Victoria Clay		Probably Duval Fine Sandy Loam	
	Surface 2870	Subsoil 2871	Surface 4212	Subsoil 4213	Surface 4940	Subsoil 4941	Surface 2191	Subsoil 2192	Surface 3237	Subsoil 3238	Surface 3239	Subsoil 3240	Surface 3540	Subsoil 3541	Surface 3542	Subsoil 3543	Surface 3544	Subsoil 3545	Surface 5908	Subsoil 5909
Per Cent—																				
Phosphoric Acid	.06	.06	.11	.10	.15	.10	.011	.....	.11	.09	.16	.099	.078	.035	.094	.065	.032	.035	.....	.....
Nitrogen	.066	.038	.07	.05	.066	.033	.104	.069	.125	.046	.136	.064	.166	.085	.193	.050	.156	.061	.0286	.034
Potash	.80	.80	.61	.....	.62	.56	.36	.....	.63	.66	1.18	.83	1.00	.94	.47	.80	.54	.67	.145	.275
Lime	3.27	6.06	5.67	7.55	5.92	6.98	.55	.....	7.06	9.48	8.37	10.81	1.28	1.25	1.03	11.04	1.35	4.06	.09	.14
Magnesia	.74	1.02	.63	.97	.28	.28	.39	.....	1.21	1.42	1.61	1.68	.....	.66	.43	.32	.97	.....	.12	.12
Aluimna and Oxide of Iron	9.83	10.07	8.03	7.88	8.00	7.62	6.72	.....	6.96	7.61	13.68	10.31	16.10	16.74	5.65	11.87	11.78	13.32	2.08	5.61
Insoluble and Soluble Silica	75.44	60.11	73.26	69.79	74.71	74.02	84.36	.....	71.22	68.00	57.69	69.76	63.18	65.12	82.11	58.73	70.51	65.66	95.50	88.81
Loss on Ignition	5.84	8.40	6.73	5.86	3.14	2.22	.....	.....	7.12	4.33	9.91	7.30	9.50	6.92	7.42	7.28	8.64	7.29	.....	1.65
Moisture	3.55	4.18	3.76	3.10	2.22	2.06	.....	.....	2.13	2.11	4.63	3.24	7.25	7.31	2.71	4.02	5.60	5.65	.....	1.62
Parts Per Million—																				
Active Phosphoric Acid	24.7	11.2	153.0	85.0	375.62	234.4	.....	.....	367.5	57.5	130.6	35.6	78.7	.....	325.0	14.48	49.3	41.3	13.3	6.6
Active Potash	368.2	84.7	335.6	156.2	252.5	106.2	.....	.....	300.0	176.2	311.2	115.0	.....	568.7	361.2	150.0	88.7	156.2	318.1	297.5
Acidity	.....	.....	.....	.....	.....	.....	0	.....	—	—	—	—	—	—	—	—	—	—	0	0

INTERPRETATION OF ANALYSES.

The standards used in this bulletin for the analyses with strong acids, are approximately as follows:

Lime:
.00-.05 per cent—low.
.051-.10 per cent—Fair in sands, low in loam and clays.
.101-.20 per cent—good in sands, fair in loam, low in clays.
.201-.30 per cent—good in sands, loam; fair in clays.
.30-.50 per cent—good in sands, loam and clays; low in very heavy clays.
.50-up—good.
2.00-up—high.
Phosphoric acid:
.00-.03 per cent—low.
.031-.10—fair in sands, low in loams and clays with low lime; fair in loams and clays with fair lime; good in loams and clays with good lime.
.101-.15—good in sands; fair in loam and clays with low lime; good in loam and clays with fair or good lime.
.151-up—good.
Potash:
.00-.05 per cent—low.
.051-.10 per cent—fair in sands; low in loams and clays.
.101-.150 per cent—good in sands; fair in loams; low in clays.
.151-.25 per cent—good in sands and loams; fair in clays.
.251-up—good.

A deficiency of lime may be offset to a certain extent by an abundance of vegetable matter. The quantity of lime present must also be considered in making the interpretation of the quantity of potash present.

STANDARDS FOR INTERPRETATION OF ANALYSES WITH WEAK SOLVENTS.

The following figures are used in interpretation of the estimation of total nitrogen, active phosphoric acid and active potash of the soil. They are based upon results published in Bulletins 126, 145 and 151 of this Experiment Station, and, in the case of phosphoric acid, on the results of additional pot experiments not yet published. The figures are not the same as those given in the bulletins mentioned, but are based upon the curve to which the actual determinations approximate. It must be recalled that these results do not represent actual field production, but are average results based upon the plant food taken from the soil in a large number of pot experiments. The results are expressed in terms of bushels of corn in order to give concrete form to them. There are exceptional soils which deviate quite widely from these results, and pot experiments themselves are somewhat variable. These variations will be studied later, and also the relation between the results of the pot experiments, and actual field production.

NITROGEN.

Percentage nitrogen	Corn equivalent (Bu.)
.000-.02	8
.021-.04	13
.041-.06	18
.061-.08	23
.081-.10	28
.101-.12	33
.121-.14	38
.141-.16	43
.161-.18	48

POTASH.

Parts per million	Corn equivalent (Bu.)
0- 50	29
50-100	37
100-150	51
150-200	80
200-300	120
300-400	157
400-600	182
600-800	207

PHOSPHORIC ACID.

Parts per million	Corn equivalent (Bu.)
0- 10	6
10- 20	12
20- 30	18
30- 40	24
40- 60	30
60- 80	35
80-100	40
100-200	45
200-400	50
400- up	(74)

We wish it distinctly understood that these figures do not represent the actual production of the soil in the field, and are not intended to do so. They merely aid in showing the relation between pot experiments, and chemical analyses. There are considerable varieties in individual soils, and the interpretation may not be strictly correct, since so much depends upon field conditions. The figures are merely intended to show the relative deficiences of the soil in the various forms of plant food. The actual field production undoubtedly is quite different in a number of cases; in many instances, considerably larger than the "corn possibility."

INTERPRETATION OF SOIL ANALYSES.

TYPE AND COUNTY	Phosphoric Acid	Potash	Lime	Corn Possibility in Bushels per Acre for		
				Active Phosphoric Acid	Active Potash	Total Nitrogen
Atascosa County—						
Norfolk Fine Sand	Low	Low	Good	18	37	13
Duval Loam	Low	Good	Good	8	157	28
Houston Loam	Good	Good	Good	12	80	18
Duval Fine Sandy Loam	Good	Good	Good	12	182	28
Bexar County—						
San Antonio Clay Loam	.....	.....	.....	30	120	13
Norfolk Silt Loam	Good	Good	High	40	207	13
Houston Black Clay Loam	.....	.....	.....	40	207	33
Houston Gravelly Clay	.....	.....	.....	24	182	28
Probably Norfolk Fine Sand Loam	Low	Good	Good	12	120	13
Bee County—						
Probably Goliad Sandy Loam	Low	Good	Good	18	182	30
Probably Goliad Loam	Good	Good	High	45	182	18
Probably Goliad Loam	Good	Good	High	12	182	30
Probably Goliad Loam	Low	Good	Good	40	120	30
Probably Goliad Loam	Low	Good	High	40	120	30
Goliad Loam	Low	Good	Good	18	182	30
Beeville Fine Snady Loam	Low	Good	Good	18	157	18
Galveston Fine Sand	Low	Good	Good	12	120	30
Brazoria County—						
Probably Victoria Clay	Low	Good	Low	12	120	48
Probably Edna Fine Sandy Loam	Low	Good	Good	18	80	38
Probably Edna Fine Sandy Laom	Low	Good	Good	12	.....	33
Probably Victoria Clay	Low	Good	Good	51	.....	43
Probably Lomalta Clay	Fair	Good	Fair	18	51	38
Calhoun County—						
Lomalta Clay	Low	Good	Good	12	120	28
Lomalta Fine Sandy Loam	Low	Good	Fair	18	37	18
Nueces Fine Sand	Low	Fair	Fair	12	51	18
Lomalta Clay	Low	Good	Good	12	.....	33
Cameron County—						
Probably Laredo Silt Loam	Good	Fair	Good	50	.....	48
Prabably Laredo Clay	Good	Fair	High	45	.....	48+
Nueces Fine Sand	Low	Good	Fair	12	51	13
Probably Laredo Silt Loam	Good	Good	High	30	.....	13
Rio Grande Silty Clay	Good	Good	High	30	.....	23
De Witt County—						
Probably Goliad Sand	Low	Good	.....	18	51	13
Goliad Fine Sand	Low	Good	Good	12	.....	13
Goliad Fine Sandy Loam	Low	Good	Good	18	120	28
Goliad Loam	Low	Good	High	12	120	43
Lufkin Sand	Low	Low	Good	12	51	13
Lufkin Sandy Loam	Low	Good	Fair	18	51	18
Houston Fine Sandy Loam	Low	Good	Good	.....	.....	18
Houston Loam	Good	Good	High	45	182	38
Trinity Clay	Good	Good	High	40	120	48+
Probably Trinity Fine Sandy Loam	Good	Good	Good	50	120	23
Dimmit County—						
Probably Webb Fine Sandy Loam	Low	Good	Good	.....	.....	18
Probably Webb Fine Sandy Loam	Good	Good	Good	24	120	18
Maverick Loam	Good	Good	Good	50	200+	33
Maverick Loam	Good	Good	High	50	200+	33
Maverick Clay Loam	Good	Good	Good	35	120	23
Duval Fine Sand	Good	Good	Good	12	50	8
Zapata Fine Sandy Loam	Good	Good	High	45	120	18
Duval County—						
Duval Fine Sand	Low	Good	Good	.....	.....	18
Duval Fine Sandy Loam	Low	Good	Good	.....	.....	23
Probably Victoria Fine Sandy Loam	Low	Good	Good	.....	.....	33
Frio County—						
Probably Duval Fine Sandy Loam	Low	Good	Fair	12	120	13
Duval Fine Sandy Loam	Good	Good	Good	6	120	13

INTERPRETATION OF SOIL ANALYSES—continued.

TYPE AND COUNTY	Phosphoric Acid	Potash	Lime	Corn Possibility in Bushels per Acre for		
				Active Phosphoric Acid	Active Potash	Total Nitrogen
Goliad County—						
Goliad Loam	Low	Good	Good	30	120	38
Lufkin Sandy Loam	Low	Low	Low	6	80	13
Hidalgo County—						
Probably Brennan Fine Sandy Loam	Good	Good	Good	35	.....	33
Probably Brennan Fine Sandy Loam	.....	.....	.....	50	207	33
Probably Laredo Clay	Good	Good	High	24	157	43
Jackson County—						
Probably Victoria Clay	.....	Good	Good	12	80	28
Karnes County—						
Probably Houston Loam	Fair	Good	High	12	157	18
Houston Loam	Low	Good	Good	18	182	43
Houston Loam	Low	Good	High	.....	.....	28
Goliad Sandy Loam	Low	Good	Good	12	120	28
Duval Sandy Loam	Low	Good	Good	24	80	18
La Salle County—						
Frio Loam	Good	Good	High	45	207	28
Frio Clay Loam	Good	Good	High	74	207	48+
Houston Loam	Good	Good	High	35	80	33
Houston Clay Loam	Good	Good	High	50	20	23
Live Oak County—						
Frio Fine Sandy Loam	Good	Good	Good	45	182	18
Matagorda County—						
Probably Victoria Clay	Low	Good	Good	.....	.....	28
Probably Edna Fine Sandy Loam	Low	Good	Good	24	80	23
Probably Edna Loam	Low	Good	High	18	120	23
Probably Edna Fine Sandy Loam	Low	Good	Good	18	80	33
Edna Loam	Low	Good	Good	12	80	33
Edna Fine Sandy Loam	Low	Good	Fair	.....	.....	23
Galveston Fine Sand	Good	Low	Good	.....	.....	.....
Medina County—						
Houston Black Clay	Good	Good	Good	45	207	28
Houston Clay Loam	Good	Good	Good	12	207+	23
San Antonio Silty Clay Loam	Good	Good	High	24	207	33
Blanco Silt Loam	Good	Good	High	12	80	23
Webb Fine Sandy Loam	Good	Good	Good	12	120	13
Nueces County—						
Probably Nueces Fine Sand	Fair	Good	Fair	6	.....	13
Nueces Fine Sand	Low	Fair	Fair	12	37	13
Victoria Clay	Good	Good	High	24	207	23
Victoria Loam	Low	Good	Good	45	157	28
Victoria Fine Sandy Loam	Low	Good	Fair	45	157	18
Victoria Loam	Low	Good	High	6	207	33
Lemarto Clay	Low	Good	Fair	.....	.....	23
Victoria Fine Sandy Loam	Low	Fair	Good	.....	.....	18
Houston Loam	Low	Good	Good	18	182	23
Refugio County—						
Victoria Clay	Low	High	High	.....	.....	33
Victoria Fine Sandy Loam	Low	Fair	Good	12	37	28
San Patricio County—						
Victoria Clay	Good	Good	High	.....	.....	43
Uvalde County—						
Frio Silty Clay Loam	Good	Good	High	18	207	33
Duval Loam	Low	Good	Good	6	120	18
Uvalde Silty Clay Loam	Good	Good	High	18	120	38
Frio Fine Sandy Loam	Good	Good	High	45	50	28
Victoria County—						
Probably Victoria Fine Sandy Loam	Low	Good	Fair	12	37	18
Victoria Clay	Low	Good	Good	12	51	.....
Victoria Loam	Low	Good	Good	18	51	23

INTERPRETATION OF SOIL ANALYSES—continued.

TYPE AND COUNTY	Phosphoric Acid	Potash	Lime	Corn Possibility in Bushels per Acre for		
				Active Phosphoric Acid	Active Potash	Total Nitrogen
Webb County—						
Probably Laredo Silt Loam	Good	Good	High	18	157	23
Probably Laredo Silt Loam	Good	Good	High	45	157	23
Probably Laredo Silt Loam	Good	Good	High	50	120	23
Wharton County—						
Probably Edna Loam	Low	Good	Good	.....	.....	33
Miller Silt Loam	Good	Good	High	50	157	38
Trinity Clay	Good	Good	Good	35	.....	48
Pledger Silt Loam	Good	Good	Good	50	157	53
Victoria Clay	Low	Good	Good	30	37	43
Wilson County—						
Probably Duval Fine Sandy Loam	.....	Fair	Low	12	157	13
Zavala County—						
Red Clay Loam	.....	Good	High	18	.....	28
Black Sandy Soil from Crystal City	.....	Good	Good	.....	.....	43

Acidity.—The acidity of the soil is given in the tables, expressed in parts per million of lime. Where the acidity is 0, the soil is not acid. Where the figure + or — is used, acidity is not determined, but the soil usually contains an abundance of lime.

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SUMMARY AND CONCLUSIONS.

This bulletin contains a description of the soil types, as found by the Bureau of Soils, of South Texas. It also contains analyses of a number of samples of these soil types, together with interpretation of the results.